ARMOR

january-february 1980

MAN AGAINST ARMOR

US ARMY ARMOR CENTER and SCHOOL

Commanding General
MG THOMAS P. LYNCH

Deputy Commanding General
BG JOHN P. PRILLAMAN

Chief of Staff
COL DUANE R. TAGUE

Command Sergeant Major
CSM WILLIAM R. PRICE

Deputy for School Activities
COL WILLIAM F. COAD

Deputy for Educational Technology
DR. CHARLES W. JACKSON

Director, Office of Armor Force Management
COL MOWTON L. WARING, JR.

INSTRUCTIONAL DEPARTMENTS

Maintenance
COL JAMES L. MARINI

Command and Staff
COL HAROLD L. PAGE

Weapons
COL ROBERT A. PLANT

Committee Group (BT)
COL REID A. BARRETT

NCO Academy/ Drill Sergeant School
CSM BENJAMIN E. PEACHER

DIRECTORATES

Combat Development
COL JIMMY L. PIGG

Training Developments
COL RICHARD L. COFFMAN

Armor Doctrine
COL JOHN H. KIRKWOOD

Armor Aviation
COL ROBERT A. HEFFORD

UNITS

The Lightning Brigade
COL ROY C. PRICE, SR.

1st AIT/OSUT Brigade (Armor)
COL HAROLD L. ROSE

4th Training Brigade
COL ERNEST D. JOHNSON

"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare; to promote professional improvement of the Armor Community; and to preserve and foster the spirit, the traditions, and the solidarity of Armor in the Army of the United States."

COVER

"What numbers of men will do in a fight will depend on what one or two men of their company put forth in moments of greatest trial. . . ." S. L. A. Marshall analyses two such cases beginning on page 30.

ARMOR

JANUARY-FEBRUARY
Vol. LXXXIX, No. 1

the Magazine of Mobile Warfare

ARMOR Magazine is published bimonthly by the U.S. Army Armor Center and School at 4401 Vine Grove Road, Fort Knox, Kentucky 40121, to stimulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters. Unless otherwise stated, material does not represent official policy, thinking, or endorsement by any agency of the U.S. Army. Use of funds for the printing of this publication have been approved by the Department of the Army, 23 February 1979.

SUBSCRIPTION RATES: Individual subscriptions to ARMOR are available through the U.S. Armor Association, Post Office Box O, Fort Knox, Kentucky 40121. **Domestic:** $8.00 one year, $15.00 two years, $22.00 three years. **Foreign:** $10.00 one year, $18.00 two years, $26.00 three years. Single copies, $1.50.

CORRESPONDENCE: Address all correspondence to U.S. Army Armor Center and School, ATTN: ATZK-MAG, Fort Knox, Kentucky 40121. (Telephone: AUTOVON 464-2249 or commerical (502) 624-2249.)

POSTMASTER: Controlled circulation postage paid at Indianapolis, Indiana, Department of the Army, DOD 314.

ARMOR may be forwarded to military personnel whose change of address is caused by official orders (except to APO addresses) without payment of additional postage. The subscriber must notify the postmaster.

USPS 464-510

LETTERS

Unchaining Not Enough?

Dear Sir:

The article, "Unchained Mobility," in the July-August 1979 issue correctly identified the shortfalls of our present service support system within maneuver battalions. The lack of mobility, coupled with the vulnerability to small arms fire, seriously hampers resupply efforts. However, is the proposed brigade service support company the cure for the illness? I think not.

There is no standard brigade organization, i.e., some brigades have two tank battalions and two mechanized infantry battalions, while in other brigades the mix varies. What the author fails to address is the numbers of vehicles and personnel in each of the four platoons (maintenance/evacuation, transportation, mess and administration). Additionally, brigades are envisioned in current doctrine as exercising command and control of up to seven battalions for limited periods of time. Would the service support companies designed to support a three-battalion brigade be able to support an additional three or four battalions? Or would the losing brigade "chop" off a slice of its service support company to support the transferred battalions?

The author's belief in tracked service support vehicles is well founded. However, relying on GOER vehicles for anything is misplaced faith. Service support vehicles should have the same cross-country mobility as the fighting vehicles to which they render support. Otherwise, our army will remain dependent on a good road network and good weather for effective service support.

The proposals set forth by the author provide the stimulus to re-examine the plight of our service support operations and organizations. The challenge has been issued; are there any who would accept?

ERNEST R. FRAZO
Captain, Armor

Needs Help

Dear Sir:

I am currently doing a research project on U.S. Armor in Vietnam, and would greatly appreciate any assistance readers of ***ARMOR*** may be able to render. I would like to copy any photos, negatives, or slides in black and white or monochrome, of the *M-48 Patton* tank, or any of its variants in action in Vietnam, submitted to me by your readers, plus any written or oral first-hand experiences af armor crew members with 11D or 11E MOSs, who served in Vietnam. All material will be returned.

I think your magazine and association are *sans pareil,* and hope you will continue your exemplary work for the edification of the armored vehicle enthusiast.

THOMAS F. MAYER
111 Oneida St., Apt G-3
Pontiac, Mich. 48053

Service Ammunition For the Reserves

Dear Sir:

During a recent training weekend, my unit had the golden opportunity to fire a limited number of *C-518* HEP-T rounds (service ammunition). After training exclusively with HEAT-TPT, HEP-TPT, and TPDS-T, our crews benefited tremendously by having this chance to see first hand what service ammunition is capable of doing.

Unfortunately, it seems that the availability of even a very limited number of service rounds is nonexistent. Training year after training year goes by with service ammunition types and quantities zeroed out of our returned ammunition forecasts. Speaking for the majority of our tank crews, we feel that is an important error of omission.

We don't know what other units are experiencing, but we feel that tank crew members have a right to know, by seeing for themselves, what each type of round for the *M-68* main gun will do to targets usually engaged by a particular round. I believe that an annual familiarization firing could be established without impacting significantly on funding or ammunition forecast quantities. For example, and this could be conducted any number of ways, my battalion of 20 assigned crews would require the following ammunition:

HEAT-T:	40 rounds
TPDS-T:	40 rounds
HEP-T:	40 rounds
APERS-T:	40 rounds
WP-T:	40 rounds

A range available at Fort Riley would be scheduled, with provisions made for range fan overlays, resupply of hard targets and other target materials, and capability through an EOD sweep, to travel down-range on an access road to view the target area after firing. Each assigned crew would fam-fire two rounds of each type, after zero confirmation with HEAT-TPT or TPDS-T at a known distance applicable to the ammo.

Allowing the crews to handle, upload, set the BEEHIVE fuse, and observe the effects would highlight tank gunnery training annually. In addition, having this type of training to look forward to would enhance morale and retention, bolster confidence, and afford realistic training with accurate expectations of what the ammo can do. I think every tank crew needs this training and knowledge, *before* the shots are in earnest.

We recommend that FORSCOM, DA, and our National Guard Bureau take another look at the feasibility of authorizing limited numbers of service ammunition for such a purpose. I think there is a big difference between a "shoot the works" firepower demonstration, and the kind of familiarization training we propose.

SAMUEL T. CONN
Captain, Armor
KanARNG

Tank Destroyers

Dear Sir:

I enjoyed your article on tank destroyers. Being an armor hobbyist, I find your magazine a good way to keep up with the constantly changing developments in armor.

Your article reminded me of an article that said that General George S. Patton, Jr. thought that tank destroyers were a waste of production facilities and that the money spent on them should have been used to mount better, more powerful guns on the tanks.

As events turned out, he was right, especially when the 75-mm gun of the *Sherman* had a hard time taking on the later models of the *Panzer IV,* let alone the *Panther* and *Tiger* tanks. The halftrack-mounted weapons, though, would have been perfect for use with mechanized infantry as they had the same chassis and mobility, and this would have made maintenance easier.

The *M-18 Hellcat,* on the other hand, was tuned down from 55 to 45 miles per hour to improve engine reliability as it had a tendency to burn out its engine due to the high speed of the vehicle and the high revolutions per minute (rpms) of the engine were more than the engine could take constantly.

The towed guns were often overrun and destroyed because when the Ger-

man armor attacked they often brought infantry with them and the infantry took care of the antitank (AT) nests. On the Russian front, whole brigades of AT guns were expended with the idea that if they could knock out one, two or three of the light models, or at least one or two of the heavy *Panther* and *Tiger* models per gun, the Russians could stop the Germans cold. The crews had orders to fight and die at their gun positions and, as it turned out, one brigade could smash half a German Panzer division before it was inevitably overrun and destroyed.

General McNair forgot a few things when he got the Army to accept tank destroyers. They were:

•The ability to take lots of punishment.

•An antipersonnel capability.

•A lid to protect the crew from a hand grenade, snipers, ricochets, shrapnel fragments, mortars, rocks,and etc.

•Light weight for towed guns. (As your article said, the heavier they got, the harder it was to move them.)

•A low profile, as guns that tall have a very distinct silhouette and are hard to hide.

It proves that the best weapon to stop a tank is another tank, since tanks are *mobile offensive weapons,* while everything else is a static *defensive weapon.* In other words, you can take a position with a tank, but you already have to have the position to use an antitank gun.

I once saw a picture of a Russian *KV I* heavy tank that looked like swiss cheese. It had 85 holes in it from light and medium antitank guns shooting at its left side (facing me) before it was knocked out. Even the famous "88" had trouble with this tank at anything but point blank range, which gives you some idea how well-protected it was. It proves that only the tank can survive the battlefield, can break through the enemy's front lines and take lots of punishment while doing so, until it's into his rear areas and chews up his supply and communications positions that support his frontline units.

MICHAEL MOSKOWITZ
Philadelphia, Pa.

More on Tank Destroyers

Dear Sir:

In his quest for knowledge and in the interpretation of it, Major Charles Baily appears to have done considerable research, as evidenced by his article, "Tank Destroyers," in the latest issue of ***ARMOR.*** I also refer to letters of mine to the Editor in the Nov-Dec 1974 and the March-April 1974 issues, as well as a lengthy letter by then Captain Baily to the Editor which was published in the July-August 1974 issue.

At that time, I contended that the "last word" had yet to be written on this subject of the quality of our World War II tanks, and who made the vital decisions regarding the tank's main gun, a 75-mm weapon. Shortly after the invasion in Normandy, this gun became the center of a controversy which persists to this day.

I would like to reiterate that there remains considerable doubt that the "last word" has been penned by Major Baily. I draw his attention and those of your readers to the following quote from page 184 of *The Ordnance Department: Planning Munitions For War* by Green, Thomas and Roots, published by the Office of the Chief of Military History, Department of the Army, Washington, D.C., 1955:

"In August 1938, before the Ordnance Department had proceeded far with procurement, the War Department issued explicit instructions to the Chief of Ordnance:

1. The Infantry is designed as the most interested using arm for the 37-mm antitank gun under AR 850-25.

2. No development funds will be expended by the Ordnance Department during the Fiscal Years 1939 to 1940 in the *development* (emphasis added) of antimechanized weapons of larger than 37-mm caliber. If the necessity for an antitank gun of larger than 37-mm caliber develops, the arm responsible for its development will be designated at that time."

This decision of the General Staff, closing the door to alternative design, was deplored by many Ordnance officers. The Chief of the Artillery Branch of the Manufacturing Division from 1937 to 1939 later stated: "The Ordnance Department was well aware that the 37-mm gun was totally inadequate as an antitank gun, and many and repeated efforts were made to convince the various interested using services personnel of this fact."

This provides a considerably different perspective from that contained in Major Baily's article. I hope that he continues his research and expands his coverage so that it will be clearer how vital decisions were made and who actually made them, together with the resulting consequences. In particular, I would like to see some light shed on the opinion, influence and actions of General George Patton on the tank gun ultimately fielded.

GEORGE EDDY
Austin, Tex.

Learn from the Past

Dear Sir:

Major Baily's article "Tank Destroyers" (July-August 1979) was interesting on its own merits, but it leaves a reader with a question which I feel needs to be emphasized. "It would seem that today's army could make more use of the ideas and experience that were so expensively purchased in World War II" and, to backtrack, "Do the concepts of the tank destroyers deserve comtemporary study?"

I would like to suggest that the question would be more forceful if presented in the light of experience of the two other parties in the European Theater—Russia and Germany. Russia in 1941 and Germany in late 1944 faced an enemy with awesome conventional military capabilities and production, while they themselves were outnumbered or outgunned, and they were unable to increase significantly expenses. It would not be too great a shift to the present day where the "potential" enemy must be faced in the light of tremendous pressures to do more with less. The parties in World War II then turned to the tank killer as a cost-effective solution, not because of its superior mobility.

Perhaps we in the U.S. need to look at the thrifty techniques of taking a large bore gun, placing very heavy armor only to the front of it, and limiting traverse to the in-turret capability. This would be far less expensive than the current tank family, and has already won the approval of Sweden in the form of the *S-Tank.*

There will always be a role for the tank in a hard-hitting, fast-moving maneuver unit and to abandon them would be foolish. Yet, although the best way to kill a tank is with another tank, I would submit that 10 Soviet-style tanks are better attacked by four tank-killers than by one *XM-1* if the cost (i.e., the likelyhood of getting either) were the same.

I do not claim this as an optimum or even good solution, for I am not a tanker by trade; but I think that the question, couched in these terms demands an answer from someone who is qualified to analyze the situation. I hope to read it here real soon.

In closing, I would like to express my appreciation to ***ARMOR*** Magazine as the only journal to attempt to explain exactly how to execute that fine-sounding phrase, "Combined Arms." Drive on!

DOUGLAS M. BROWN
First Lieutenant, FA
Wahuawa, Hawaii

S-Tank is not a Christie

Dear Sir:

The enthusiasm for vehicle recognition evidenced by Cadet John Hendricks in his "Letter to the Editor" (page 3, July-August 1979) is laudable. His discription of the Swedish *STRV-103* is somewhat in error, however, on at least two points.

The accompanying photo clearly shows the return rollers used on *S-Tanks*. The operator's manuals for this vehicle renders these in English as "backing rollers," but regardless of their nomenclature, their presence is (relatively) indisputable. Their function, by the way, is particularly important on *S-Tanks* in maintaing the track envelope not only by damping standing waves on the return track run and aiding in terrain adaption, but also as the primary compensation for track tension in the gunlaying mode of the suspension.

STRV-103

Cadet Hendricks also falls prey to the myth of the "Christie-type" suspension, perpetuated in part, sad to state, in the pages of this august journal. While it is true that Walter J. Christie pioneered the use of large roadwheels and flat (i.e. sans return roller) loose track as a means of reducing rolling resistance and track-induced horsepower loss, it does not follow that all such suspensions should bear his name. Allegations to the contrary are as spurious as the conclusions that Canadian Tankers are part of the British Army because they wear black hats and salute with palms outward.

In fact, the definitive feature of the Christie suspension is a more or less vertical coil-spring unit, often with enclosed friction dampers, working through the hull to an exterior crank-like suspension arm. Christie's genius in discarding railroad flatcar suspension technology in favor of a truly modern high-compliance, high-speed suspension was recognized by the Russians in a series of Christie-suspended tanks culminating in the *T-34*. I do not believe any major power had fielded a Christie suspension since the *T-34*. Although true Christie suspensions have been overshadowed by materials and technologies not available in Christie's day, his contribution to the evolution of the tank from the lumbering pillbox of WW I to the highly agile weapons platform of today stands as a milestone of modern military technology.

JAMES D. BROWN
Captain, Armor
Armor and Engineer Board

Christie Suspension Explained

Dear Sir:

In "Letters to the Editor" and the "Recognition Quiz Answers" in the July-August 1979 issue, reference was made to the Swedish *S-Tank* and the Japanese *Type 74* tanks employing a Christie-type suspension. This is not true. In very basic terms, the suspension is the means of support between a tank's road wheels or tracks and it's body, motor, driving train, and weapons system. Both the *S-Tank* and the *Type 74* employ a hydro-pneumatic suspension which, mechanically, is quite different in function than the Christie system.

In 1928, Christie introduced his famous, revolutionary tank chassis employing the helicoil suspension principle which he called "Coil Spring Knee Action Suspension." Christie used long railroad springs which were housed vertically between two side hull plates. (figure 1). Neither the *S-Tank* nor the *Type 74* utilize this feature. The last to use the Christie suspension were the British and the Soviets. At the end of WWII, the Christie suspension was dropped.

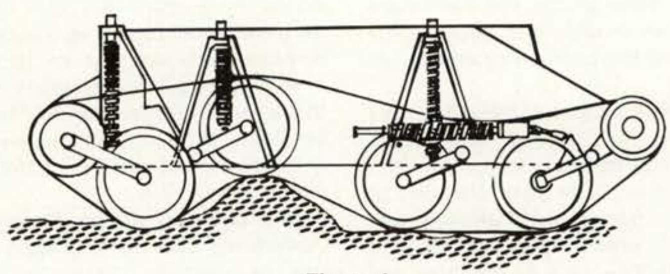
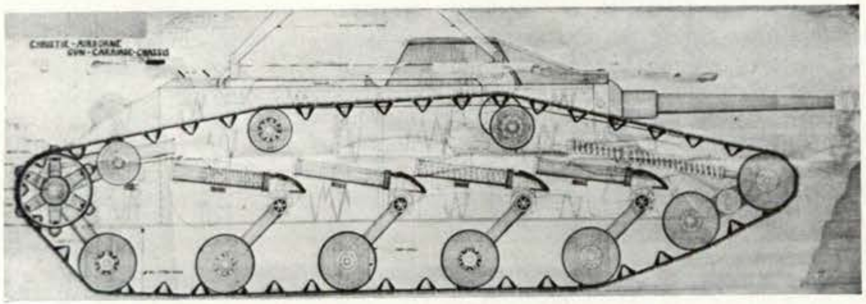


Figure 1

Post-war tanks began employing torsion-bar and the Horstmann-type suspension systems and later, as tank technology improved, the hydropneumatic type. Ballistically, the Christie system was more vulnerable since battle damage made it more difficult to repair the spring system that was housed between two armor plates. Also, the space required to house the helicoil springs made for wasted hull space.

Christie's last model, which did not go beyond the drawing stage, was unique in that it employed return rollers (figure 2). But the long helicoil springs were positioned more in a side horizontal mode than in the usual side vertical mode. Still Christie stayed with the "Coil Spring Knee Action Suspension" which he felt was superior to the torsion bar type.

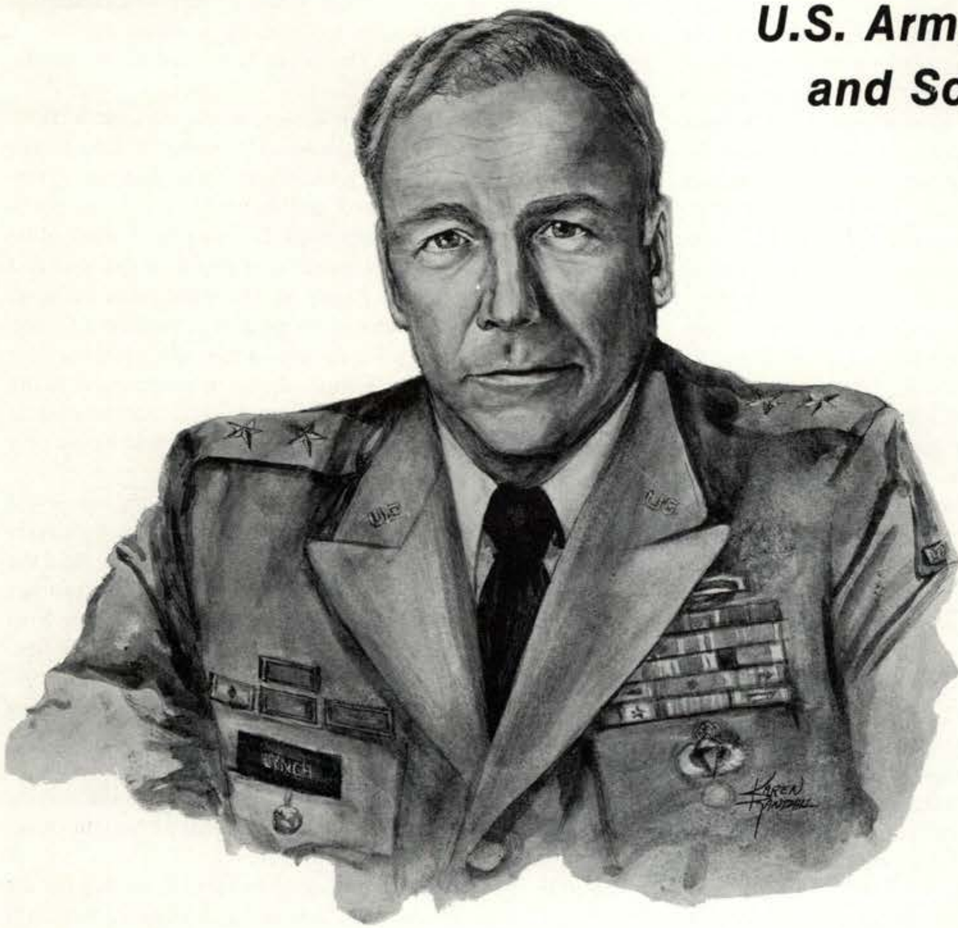


I may also add that I found Major Charles M. Baily's article on tank destroyers most interesting. It was good to see a pertinent historical article with an analysis rather than just straight facts. Who said, "Those who fail to digest the mistakes of History are condemned to repeat them?"

GEORGE F. HOFFMANN
Cincinnati, Ohio

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commanding General
U.S. Army Armor Center and School



Armor Training Strategy for the 1980's

I thought it would be appropriate to launch this new decade by outlining, in part, Armor's strategy for the 1980's. Accordingly, this edition of *Commander's Hatch* will deal with a new training strategy. It is an ambitious project which will take time to implement,, but is necessary if we are to meet coming challenges.

Our present Armor training concepts, for the most part, are obsolete in their adequacy to prepare the Armor Force for and sustain it in combat. We must be prepared to meet commitments on a moment's notice; thus, the time to prepare for war is before the opening of hostilities. Our studies and the feedback you have provided show that training is falling behind force modernization and the tactical requirements generated by a numerically superior, highly motivated, and sophisticated threat.

The strategy is a radical departure from the way we now do some things. It is a change in training that refocuses the 200 years plus concept of equipping men for war to that of manning weapons systems with men trained to operate them on a battlefield unparallelled in violence and lethality. An underlying tenant is that we do not have the time or the resources to train everyone in everything nice to know. We must, therefore, concentrate on teaching the skills essential to *combat* as well as is possible in the time available.

The strategy concentrates on the tank crew as the backbone of Armor combat power and progressively trains the crewman

for the responsibility he will receive as his career develops.

A systematic analysis of the modern battlefield to determine what must be accomplished at the killing level, followed by an analysis of training and readiness produce conclusions not palatable to some.

For instance, ground combat will be a series of coordinated platoon fights with the commander above company level seldom, if ever, seeing all of his unit simultaneously in battle. That means more of the combat orders, which result in death and destruction, will be given by lieutenants and sergeants, with success depending on the initiative and competency of tank crews.

Currently, the training base is not adequately preparing the sergeants or the tank crews for their awesome responsibilities, albeit it is doing a pretty good job with the Armor lieutenants whose training was modernized in accordance with the Tank Force Management Study. The strategy Armor proposes for the 1980's centers training on the tank crew, concurrently realigning training base resources so that most of the effort and money is expended to develop and train the NCO leadership which, in the final analysis, must carry the fight through.

Under our present training, new entry Armor soldiers receive considerable training which does not contribute to their ability to fight their tank; and, in some cases, overtrains them for the first job they will have in a unit. On the other hand, training base institutions train NCOs in the functions of peacetime but fail to provide them realistic combat and job-related leadership training needed to them effectively prepare to command their weapon system and crewmen. The result is that privates often join units hamstrung by serious shortfalls in competent NCO leadership because we have largely failed to train NCOs to replace the old experienced hands who became casualties or retired. In some units, competent NCO leadership is the exception rather than the rule because our training programs over the past few years have concentrated on the new entry ranks while, for the most part, neglecting NCO training before changing the training programs of new entry armor soldiers. At some point, when enough NCOs have been trained, we would change training programs for new Armor soldiers to concentrate on the essential combat skills without consuming valuable training time in the unnecessary pursuit of less-critical skills and knowledge.

The proposed strategy would also impact on unit training. Although unit training would continue to have collective training as its focus, the strategy would ease some of the unit requirements for individual cross-training and MOS management. The new entry-level courses would produce an Armor crewman already cross-trained to function to vehicle-specific standards in each of the three subordinate crew positions. This would eliminate the assignment problems and most of the cross-training problems the unit now faces. The unit training effort would become more meaningful as NCO graduates of Armor Courses would be thoroughly trained in the combat essential tasks of their job. A new thrust in SQT, concentrating on the crew in lieu of the individual, would enhance the collective training effort and would properly place more of the training responsibility on the tank commanders. The new-strategy SQT sould be administered to the crew in and with the tank under field conditions rather than to the individual. It would be conducted concurrently with major training such as gunnery and ARTEP and would not require a separate program managed by the unit.

Briefly, the restructuring of institutional courses would be from the top down. The Advanced NCO Course would become a Platoon Sergeant Course restructured to provide the platoon sergeant the skills necessary to do his job in combat before he assumes the position. It would be a prerequisite for promotion to E-7. Training would center on platoon employment, support, and training, with considerable emphasis on gunnery. As a matter of fact, the majority of the Master Gunner Course would be part of the Platoon Sergeant Course; the concept being to provide eventually a master gunner in each platoon and thus improve unit gunnery instruction and performance. In time, the commander would be afforded greater input in the selection process for platoon sergeant training in order to insure trained NCOs are, in fact, used in the job for which they are trained.

The basic NCO Course in armor would become a Tank Commander Course. The thrust would be to teach those things necessary to employing the tank effectively in combat. Training would be focused squarely on that goal in every way possible. The strategy calls for the Tank Commander Course to be centralized at Fort Knox to take advantage of the facilities and resources at the Home of Armor and to standardize training. We propose to train tank commanders regardless of their grade so that the man doing the job in the unit is the one who receives the training. In Armor, the tank commander is the key, and he is where our training emphasis should be placed. At some point, successful completion of the course would be a requirement for promotion to E-6.

After NCO training is sorted out and functioning, we would turn our attention to new entry soldiers. It must be clearly understood that the key to success is to first train and field the sergeants who will lead them in the fight. Another advantage of our proposed strategy is that the Armor Training Base Programs during peace would be the same used during mobilization and war. The advantages are so obvious that no discussion is required here, but it should be mentioned that during war we would also train crew, platoon, and company replacement packages. Whether these replacement packages are kept pure or cross-leveled with veterans will depend on the gaining unit commander who should know the needs of his unit better than anyone else.

Overall, this decade is destined to be an exciting one for the Army and for Armor. The upcoming new equipment will revolutionize our ability to fight, but only so long as our training keeps pace. The Armor Center is fully committed to improving combat readiness and exploring ways to enhance mobilization through effective training programs. Our strategy proposals for the 1980's are but one step in that direction. Our training sights are set high, and we do not intend to miss the target. Your comments will be appreciated. Forge the Thunderbolt.

Ivan's Alley

"Welcome to Ivan's Alley. In the next 20 minutes you will be confronted with Soviet, Allied, and US tanks and armoured vehicles. In front of you, you will see three screens, from left to right, A, B, and C. There will be a total of 10 engagements, some single, some multiple targets. You will have to identify vehicles as Soviet, US, or Allied. In multiple engagements, you will have to pick the Soviet vehicle most potentially dangerous to you. You will have 10 seconds from the time the first three targets are flashed on the screen to identify and fire on the correct target. The individual targets in an engagement will disappear at 10-second intervals. You must engage the most potentially dangerous target first as it will appear on the screen the shortest time. After all three screens have gone blank, the vehicles will reappear one at a time, most dangerous first, along with a verbal identification and designation of the type of ammunition to be used against it. All targets will then disappear and you will be instructed to prepare for the next engagement. Your first engagement will start in 15 seconds. Good hunting!"

That is the introduction for a new training program being used by members of Company M, 3d Squadron, 107th Armored Cavalry Regiment, Ravenna, Ohio. The program, called Ivan's Alley, is a portable, inexpensive device for which most major components can easily be obtained. The program provides training and testing in vehicle identification, target acquisition, fire commands and crew responses, and crew duties in a timed exercise using an interesting teaching device with a shooting gallery atmosphere. Levels of proficiency can be varied by changing the time element (10, 15, or 20 seconds) which is recorded on the cassette tapes. A 3-hour identification course is given prior to presenting Ivan's Alley. All instructions and explanations and audio effects are given over the crew headsets. Lead-in wire is tied in from the tape amplifier output (speaker jack) to the radio intercom amplifier input inside the turret.

A voice tape is made of the program, fire commands, and crew responses through the use of a second tape recorder tied in through the external phone box. This tape can be critiqued later during debriefing for on the spot corrections by an assistant instructor or a debriefing team.

It is preferable that this program be presented in a large inclosed area where the light can be controlled. It can, however, be set up in the field by placing the screens and projectors in the back of three 2½-ton trucks to attain the level of darkness desired for sharp images. Setup time indoors is 1 hour. Screens are hung at different levels to force the gunner to depress and elevate the gun tube. Screens are placed at intervals of up to 25 feet to allow the gunner to traverse over a greater arc between screens.

Cassette programs are initially made with slide changing impulses on the left track and voice programs and special effects on the right track, i.e., explosions and machine guns. This is accomplished by sound-over-sound methods.

The program, dubbed Ivan's Alley, is projected from the DeCarolis Device which has met with great enthusiasm. The tape control synchronizer is central to the whole idea. When I came to Company M, 3d Squadron, 107th Armored Cavalry Regiment, I was introduced to gunnery training, subcaliber Tables I, II, and III and the laser firing device. But the program was lacking in realism and excitement and offered no challenge. This is when I began to see the potential which the DeCarolis Device had. It provides excellent training in several fields at once, i.e., tank identification, target acquisition, fire commands and crew responses, and gunnery skills. But most important, it includes the excitement of a shooting gallery and the challenge of the many electronic games which are on the market today. Knowing the success of these games, I felt the DeCarolis Device would be well received.

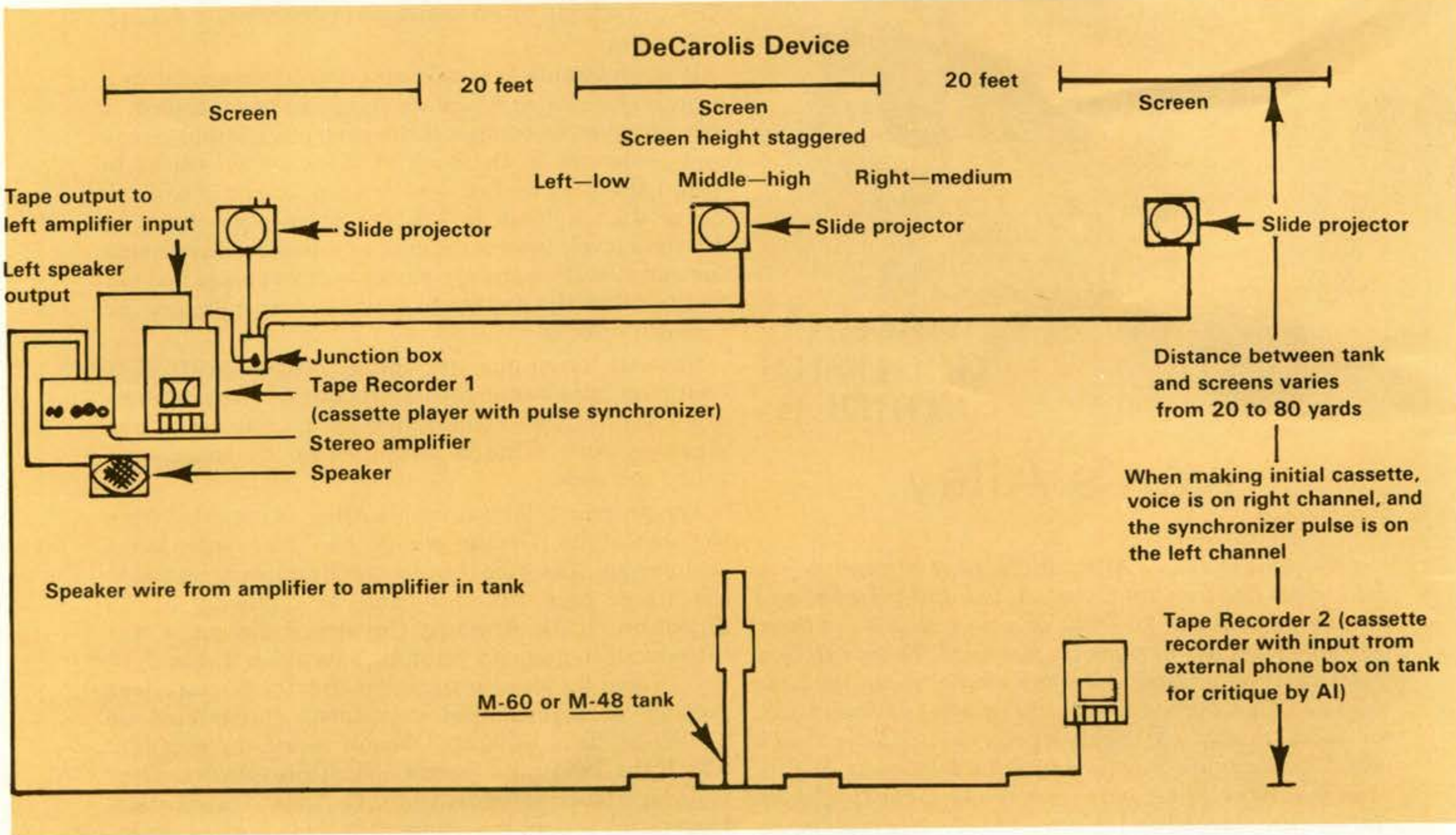
An important part of Ivan's Alley is the 3-hour tank identification class which precedes the actual running of the program. At the end of the class, slides of tanks are shown for 1/10 second and the student is asked to identify the vehicle, the country it is from, and whether it is a "kill" or "no kill." This idea was adapted from a speed reading course where a tachistoscope was used to flash sentences, paragraphs, and then whole pages on a screen. This method is supposed to allow one's subconscious mind to comprehend something of which one is not consciously aware. I understand this was a technique used during WW II to train air spotters to quickly identify planes.

The program has been accepted with enthusiasm by the men, and they enjoy the challenge that Ivan's Alley provides. Since its initial showing, I have received requests from National Guard and Reserve Armor Units asking for more information about the system.

The last statement heard over the headset at the completion of the program brings the reality of this training into focus for the tank crews:

"You have now completed Ivan's Alley. Please remove your dead and wounded before leaving the tank."

JOHN R. DECAROLIS
Second Lieutenant
Co M, 3d Sqdn, 107th ACR



Converting the M-2 HB

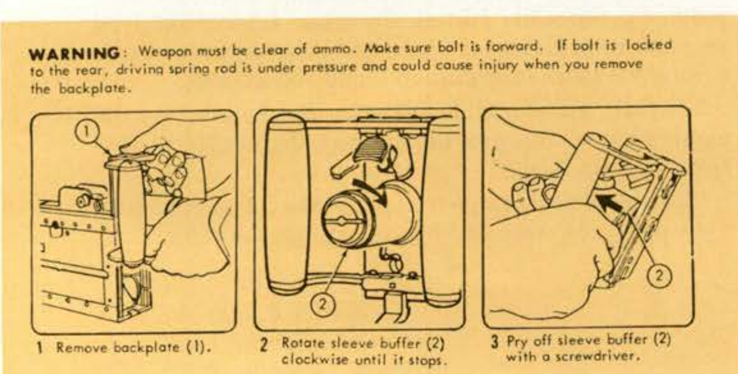
Letters and telephone calls to the Master Gunner Branch have prompted us to provide Master Gunners in the field with information regarding problems units have been having with conversion of the cal. .50 *M-2* HB machinegun to electrical firing for use with the *M-179 (Telfare)* subcaliber training device. The information provided is found in TM 9-6920-374-12&P. This manual is expected to be fielded with the *M-179* training device sometime in early 1980. Copies of this manual can be obtained by writing: US Army Material Readiness Command, ATTN: DRSAR-MAS, Rock Island, IL 61299.

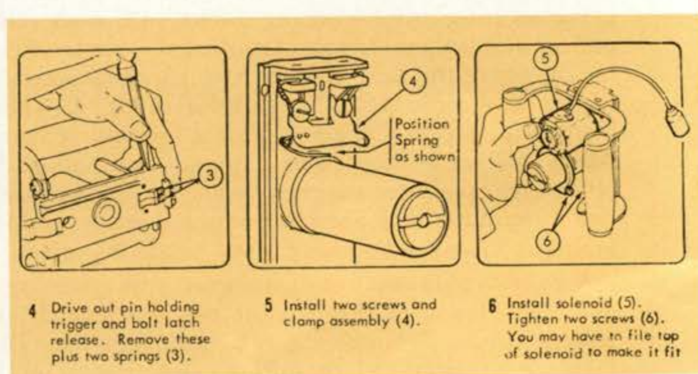
The procedure for converting the *M-2* HB to electrical firing is relatively simple, but you will find that some special tools will be required. These tools can be found at direct support level. The items necessary for conversion are:

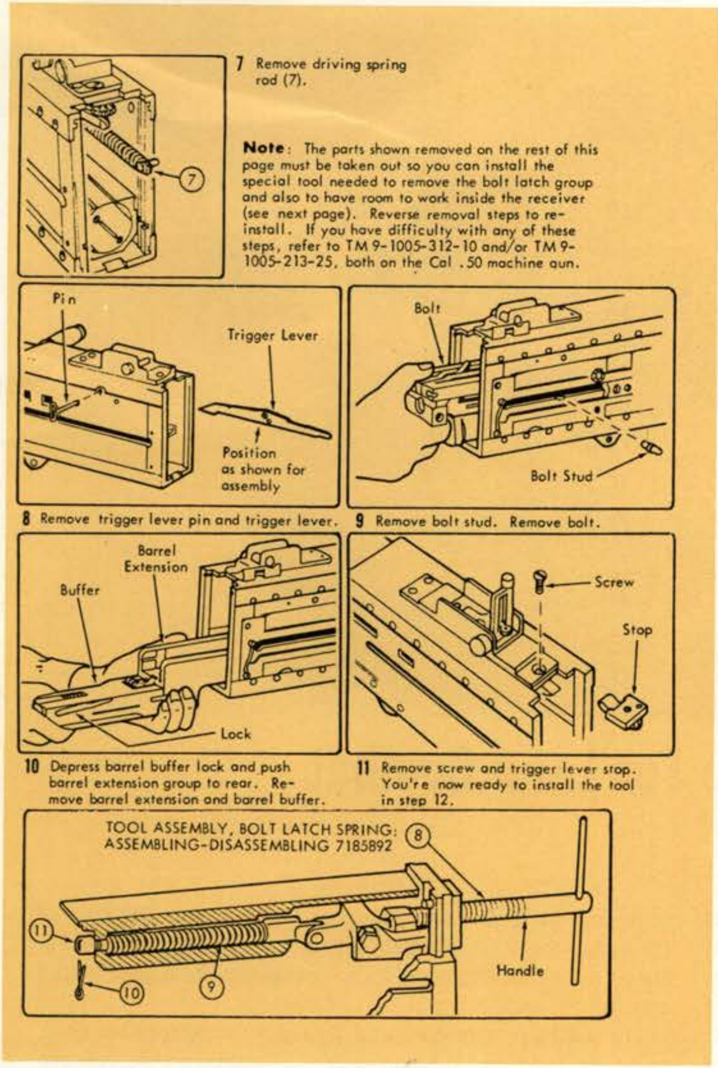
ITEM	NSN	PART NUMBER
Solenoid, Electrical	5945-00-630-0901	19207-8724532
Wiring, Harness Assy		19200-11828588
Controller Assy (Single Shot Device)	1005-00-305-0762	19204-8720102
Pull Cable Assy	1005-00-305-0762	19200-11828580

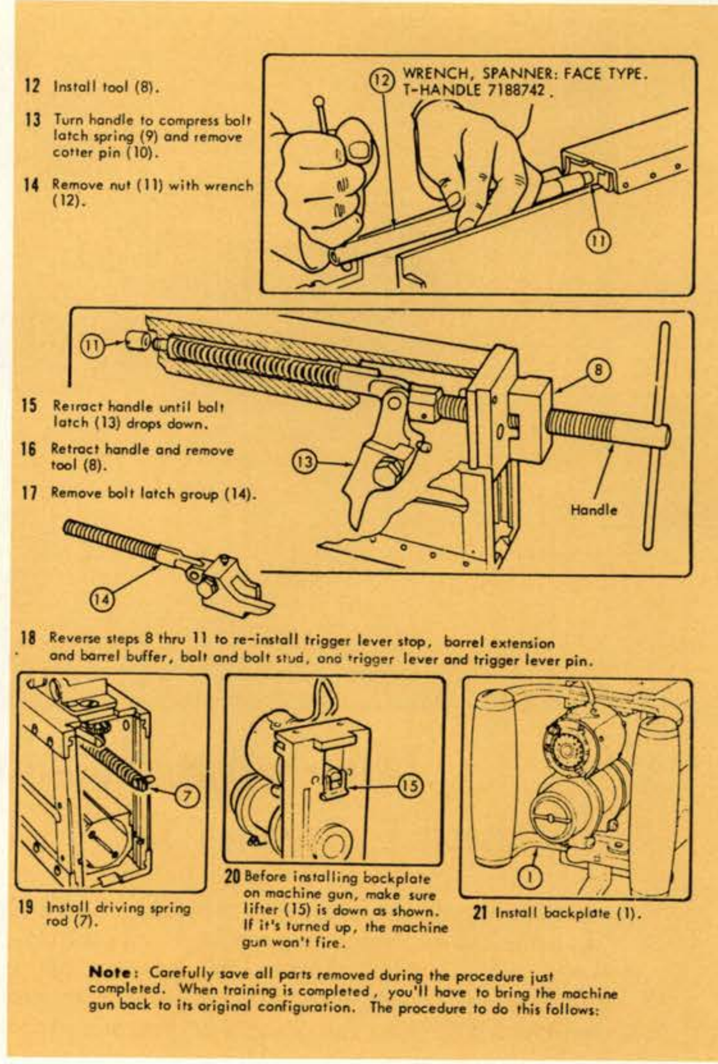
It should be noted that the *tank crew* is *not* authorized to remove or install the receiver bolt latch. The procedure for removal of this item is furnished only to show maintenance personnel what has to be done to completely adapt the cal. .50 for electrical firing.

MILFORD E. DEAVER
Staff Sergeant, Senior Instructor
Master Gunner Branch









Subcaliber Clearing House

The Office of Armor Force Management (OAFM) has been designated as the US Army Armor Center's "clearing house" for field-generated ideas regarding subcaliber training devices and other related suggestions. OAFM will:

- Review concepts and ideas for applicability and use by units to improve training and gunnery skills.
- Forward those concepts requiring testing or procurement to Directorate of Training Development or Combat Developments for evaluation.
- Publish a consolidation of worthwhile ideas and concepts at regular intervals.

Suggestions should be submitted to:

Commander
US Army Armor Center
ATTN: ATZK-CG-AM(T) (Mr. Stewart)
Fort Knox, KY 40121
Telephone: Commercial 502-624-2710
or AUTOVON 464-2710

Armor Conference 13-16 May 1980
Training the Combined Arms Team

Tank—War Machine For Land Combat

by Joseph E. Backofen Jr.

The desirability and survivability of the tank on the modern battlefield has been questioned often since the close of World War II. Most recently, this question has been highlighted by the large losses that occurred on both sides of the October 1973 War. This article is the first of a series that will briefly examine both the need for some form of tank with lessons drawn from history, and the technologies of armor penetration, armor, and survivability. The articles will be heavily referenced such that the reader can pursue the individual subjects to greater depth than can be presented in any one article or series of articles.

The tank was born from a long-term need for a land-based system that combined firepower, protection, and mobility. The basic concept was demonstrated long ago in the war chariots of ancient civilizations and the armor-clad knights of the Middle Ages.[1-3]

If one questions the role and survivability of the tank, then one should first question the survivability of a man, a man-portable weapons system, or an unprotected (unarmored) weapons platform in the environment of modern blast, fragment, nuclear, chemical, and biological weapons.[4] A basic feature of the tank is that it raises the threshold of weapon capability to injure a human by requiring the weapon to first defeat the armored envelope.

In land combat two things are certain: the need to occupy and to traverse ground. The occupation of ground with human protection can be accomplished by means of fortifications which can be both elaborate and resistant to attack.[5,9] Weapons can be used from these positions to deny the real estate to others or to punish them for their trespass. However, for economic and practical reasons, fortifications cannot be situated to command every acre of the terrain. When fortifications are distributed at strategic locations, even the best of them are subject to localization and destruction under concentrated mass and firepower as was witnessed in World Wars I and II.[5]

The need to traverse ground led from forced foot marches, to horses and horse-drawn vehicles, to trains, and to wheeled and tracked vehicles. The need to traverse ground in some relative safety led to the adoption of armor on men, animals, carts, trains, and vehicles.[1-3] The modes of transport also provided for the carrying of weapons which could be used for protection or assault depending upon the degree of specialization. However, one tends to think of the tank as a land vehicle possessing a *balance* of firepower, protection, and mobility that enables it to close with and destroy the enemy.[7-10]

In response to the question of whether tanks are still needed today, Major-General B. de Montaudouin has recently synthesized the following:

> "In War, to maneuver is to combine fire and movement to strike at the enemy at the right place and at the right time. Now, with the proliferation of weapons on the battlefield, movement—and therefore maneuvering—is illusory without a certain amount of protection. . . . The tank. . .remains a weapons system that allows maneuvering thanks to a judicious balance between firepower, mobility, and protection."[11]

Similarly, Major Rhoderick-Jones has noted the following:

> "One thing is certain: the land battle in northwest Europe—the need to defend and to occupy ground; to maneuver in the face of the enemy; to switch quickly from defense to attack—will, in the time frame of the next tank, depend on a land-based vehicle which combines firepower, protection, and mobility."[12]

He also goes on to note that aircraft, including helicopters, cannot occupy or hold ground. Similarly, they cannot carry as heavy an armament in quality of target effect and quantity as

that carried by ground vehicles within the constraint of similar system cost.

Between World Wars I and II, J. F. C. Fuller stressed a naval force approach to mobile tank operations with "Battle Cruiser" tanks as a core force of a mechanized army.[3,13] Others visualized tanks anywhere from mobile pillboxes ("perambulating fortress") for infantry support to the replacement of horses for the cavalry.([3,14,15]) The basic development drives at that time appear to have been either one of finding an organization to utilize the new machinery or of finding a role for it within existing organizational structures.

Quite possibly not enough attention was being paid at that time to prior and concurrent developments in the field of naval war machines, to which Fuller likened tanks. There one would have noticed a similar but preceding trend in armor, mobility, and armament, as well as multiple task force/ship coordination using radio. Regarding the latter, German *Blitzkrieg* operations were very much facilitated by Heinz Guderian's introduction of radios into every tank and tactical vehicle.[16]

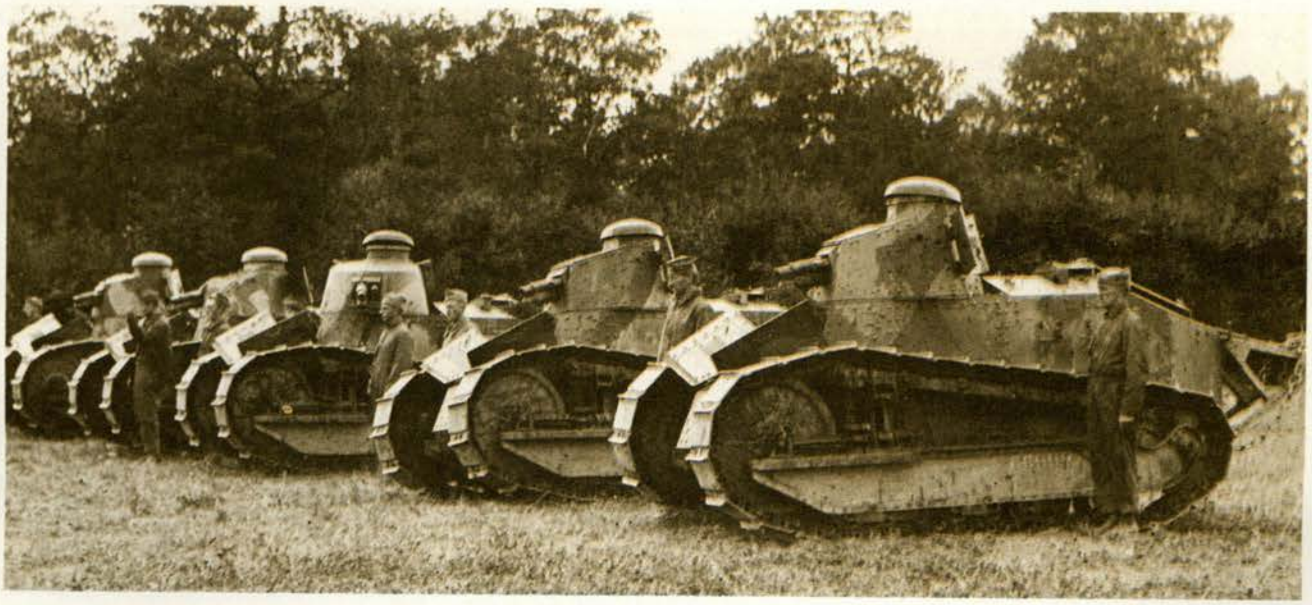
Radio communication is both the strength and weakness of the tank and the formations in which it is a part. It is the device used to tell the tank where and when its presence and firepower should be used. It controls maneuver. Without the radio, the tank would be like a wandering whirlwind, potentially devastating but aimless. The reduced effectiveness would be similar to that of nineteenth century naval surface raiders plying the shipping lanes waiting to engage lesser opponents while hoping to avoid a chance confrontation with significant naval units.

There are many similarities between naval surface warships and tanks. The initial similarities are due to the fact that the warship is meant to project force by traversing and occupying a position on the sea. The weaponization of the warship with firepower, armor protection, and mechanization for improved mobility preceded the developments in land combat vehicles.[2,17] The warship also met the weapons that made it too costly and obsolescent for battle before similar tools were applied to the tank: mines—cheap, silent devices (1860s) that could singly destroy a major warship such as the battleship *Petrospavolvsk* at Port Arthur in 1904;[18,19] torpedoes—wire guided projectiles (1860s to 1880s) that provided a high probability of hit at a critical point with a large warhead (impact below the waterline and armor belt);[18,19] aircraft-dropped bombs—dumb bombs were dropped from 800 feet against the Turkish warship *Sulton Selin* in 1917;[19] and precision guided munitions—radio and television-guided glide bombs and missiles such as the *Fritz X* used to sink the Italian battleship *Roma* on September 9, 1943.[20,23]

There is one striking difference between a warship and a tank—size. The difference between the natural environments of sea and land cause the warship to be larger and more costly than the tank. These have made the warship an individual prime capital asset of higher importance for technology application for both protection and destruction. So it is not surprising to find aircraft attached to warships for target sighting and the dropping of mines even before World War I[24] or a triaxial stabilizing system for the dual 10.5-cm high-angle antiaircraft guns of the German Navy ships prior to World War II.[18,25] These preceded the air-to-ground cooperation envisioned by Liddell Hart and Heinz Guderian, as well as tank gun stabilization helpful to firing from quick halts or on the move.

Turrets appeared on warships in order to provide firepower during maneuver. Range finders were employed in order to increase the probability of hitting a target; while smoke and camouflage paint configurations were used to blind or deceive enemy gunners. Radar was used during World War II for both target detection and ranging in darkness and all-weather situations. More recently, guided missiles have been used as precision guided munitions between ships such as for the sinking of the Israeli destroyer *Eliath* in 1967 and in the sea battles off Syria during the October 1973 War. Could these be precursors of radar detection and targeting for tank-on-tank battles, using radar-directed, precision-guided projectiles?

To answer this question, as well as others of projecting sea warfare trends to land warfare, one must look at the differences between the two. The most striking difference is that the sea is relatively flat in comparison to land. This means that target detection and ranging can occur at large distances. These distances then drive the need for weapons that can accurately deliver lethal blows against large armored targets which need to be made unstable with respect to their environment to see them sink harmlessly under the waves.



For tank warfare, the ranges are much shorter, the targets are much smaller, and they are on firm ground. Research has determined that the majority of all targets in the mid-European zone lie at ranges up to 2,000 m (50 percent under 1,000 m, 30 percent between 1,000 and 2,000 m, and 20 percent over 2,000 m).[26] NATO research on the northern half of West Germany gave the following ranges at which it would be possible to open fire: 83 percent of targets 1,000 to 3,000 m, 8 percent of targets 3,000 to 4,000 m, and 9 percent of targets over 4,000 m.[26]

Historical ranges of optical detection have supposedly been 300 to 1,000 m,[27] and in the October 1973 War, the average combat distances were supposedly between 300 and 800 m.[28] The urbanization of Europe certainly should not lead to increased ranges of engagement. So the effectiveness of tank weapons and the trends in the technologies used in them should be judged within this more compact battlefield that is likely to be cluttered with natural terrain features, man-made structures, battlefield debris (killed targets, craters, and so forth), and mobile armored targets. However, one cannot ignore the possibilities of useful technology transfer from another field such as sea warfare.

Future articles in this series will deal with armor penetration, armor, and survivability. They will deal not only with the development of technology for tanks, but also with the transfer of technology from other weapons systems, in particular, the warship. Examples of the use of spaced and composite armor will be taken from ship construction.[18, 19] The use of spall liners for crew protection will be looked at in light of rope blankets used as spall liners in fortifications.[5]

The development of kinetic energy projectiles and their effects against monolithic and composite armor will be reviewed from their usage in ship, fortress, and tank armor attack.[5, 7, 10, 19, 24, 29] The weaponization of the shaped charge and its effectiveness against tanks and their components will be reviewed from a historical point of view.[30] The survivability of the tank will be examined in the particular light of compartmentalization such as was found helpful and lacking in the design of German and British warships, respectively, during the Battle of Jutland in 1916.[18, 31]

REFERENCES

[1]K. Macksey, "Tank Facts and Feats," The Two Continents Publishing Group, New York, 1974.
[2]D. Bowen, editor, "Encyclopedia of War Machines, An Historical Survey of The World's Great Weapons," Octopus Books Limited, London, England, 1977.
[3]R. M. Ogorkiewicz, "Armoured Forces, A History of Armoured Forces and Their Vehicles," Arco Publishing Company, Inc., New York, 1970.
[4]M. Lumsden, "Antipersonnel Weapons," Stockholm International Peace Research Institute, Crane, Russak & Company, Inc., New York, 1978.
[5]I. V. Hogg, "Fortress, A History of Military Defense," St. Martin's Press, New York, 1975.
[6]K. Mallory and A. Ottar, "The Architecture of War," Pantheon Books, New York, 1973.
[7]R. M. Ogorkiewicz, "Design and Development of Fighting Vehicles," Doubleday & Company, Inc., Garden City, New York, 1968.
[8]D. Crow and R. J. Icks, "Encyclopeida of Armored Cars and Half-tracks," Chartwell Books, Inc., Secaucus, New Jersey, 1976.
[9]D. Crow and R. J. Icks, "Encyclopeida of Tanks," Chartwell Books, Inc., Secaucus, New Jersey, 1976.
[10]A. Kh. Babadzhanyan, editor, "Tanks and Tank Armies," Voyenizdat, Moscow, 1976.
[11]B. de Montaudouin, "Are Tanks Still Needed on The Modern Battlefield?", Armees d'aujourd'hui, No. 24, October, 1977, pp 44-47.
[12]R. Rhoderick-Jones, "A Soldier's Tank," Journal of the Royal United Services Institute for Defense Studies, September, 1975, pp 30-34.
[13]A. J. Trythall and B. Bond, "The Fuller—Liddell-Hart Lecture," Journal of the Royal Services Institute for Defense Studies, March 1979, pp 21-31.
[14]Anon., "History and Role of Armor in the U. S. Service," 1973 reprint by Normount Technical Publications, Wickenburg, Arizona.
[15]J. Milsom, "Russian Tanks 1900-1970," Stackpole Books, Harrisburg, Pennsylvania, 1971.
[16]Conversations with General Hermann Balck, January 12, 1979, Battelle's Columbus Laboratories, Tactical Technology Center, Columbus, Ohio.
[17]R. Hough, "A History of Fighting Ships," Octopus Books Limited, London, England, 1975.
[18]A. Preston, J. Batchelor, C. Campbell, and J. Gurney "Battleships 1856-1977," Chartwell Books, Inc., Secaucus, New Jersey, 1977.
[19]W. Hovgaard, "Modern History of Warships," 1920, reprinted by United States Naval Institute, 1971.
[20]I. V. Hogg and J. Batchelor, "German & Allied Secret Weapons of World War II," Chartwell Books, Inc., Secaucus, New Jersey, 1976.
[21]R. Lusar, "Die Deutschen Waffen and Geheimwaffen des 2. Weltkrieges und ihre Weiterentwicklung," J. F. Lehmanns Verlag, Munchen, 1958.
[22]R. R. Pocock, "German Guided Missiles of the Second World War," Arco Publishing Company, Inc., New York, 1967.
[23]Th. Benecke and A. W. Quick, editors, "History of German Guided Missiles Development," AGARDograph No. 20, Verlag E. Appelhans and Company, Brunswick, Germany, 1957.
[24]V. Hythe, editor, "The Naval Annual 1913," reprint by Arco Publishing Company, Inc., New York, 1970.
[25]H. Lyon, "The Encyclopedia of the World's Warships, A Technical Directory of Major Fighting Ships from 1900 to The Present Day," A Salamander Book by Cresent Books, New York, 1978.
[26]F. Schreier, "The Modern Battle Tank, Part 2: Firepower," International Defense Review, Special Series - Battle Tanks, pp 15-22.
[27]R. M. Ogorkiewicz, "Present State of the Art of Battle Tank Technology," Militar Teknish Tidskrift. No. 3, 1976, pp 5-27.
[28]H. W. Jung, "Fire Power and Armor Protection," Kampftruppen No. 5, 1976, pp 161-173, and No. 6, 1976, pp. 213-214.
[29]I. V. Hogg and J. Batchelor, "Naval Gun," Blandford Press Ltd., Poole, Dorset, England, 1978.
[30]J. E. Backofen, Jr., "The Weaponization of Shaped Charge Technology," Proceedings of the Fourth International Symposium on Ballistics, October 17-19, 1978, American Defense Preparedness Association, Washington, D.C.
[31]B. Fitzsimons, editor, "Warships and Sea Battles of World War I," Beekman House, division of Crown Publishers, Inc., New York, 1973.

JOSEPH E. BACKOFEN, JR. was commissioned in the Corps of Engineers upon graduation from the Polytechnic Institute of Brooklyn in 1966. While with the 62d Engineer Battalion, his service included Rome Plow Land Clearing Operations in Cambodia and Vietnam. Mr. Backofen is currently involved with the development of advanced weapons technology at Battelle Columbus Laboratories.

Armor School students get acquainted with *XM-1* (upper left). TV crew films a segment of ABC's program 20/20 featuring XM-1 (center). Inspecting the drivers compartment (lower left). *XM-1* speeds cross-country (upper right). Mud-spattered Secretary of the Army Clifford L. Alexander, Jr. chats with MG Thomas P. Lynch, CG, USAARMC, following Alexander's ride in the *XM-1*.

A Proud Bunch

by Major David W. Owen

They have driven 4,000 miles in torrential rain, choking dust, snow showers, and sleet; through knee-deep mud, cross-country, and at high speed on paved roads—night and day, 7 days a week for weeks on end. At halts, there is maintenance to pull, reports to make, and always there are the VIPs, news media, and just plain curious soldiers to ask questions, clamber about, probe and pry, and sometimes just plain get in the way.

Then with 4,000 miles behind them, they are asked to go another 2,000 under the same conditions.

That sort of thing could be a morale buster; but not for Company H, 2d Squadron, 6th Cavalry at Fort Knox. They are testing the *XM-1* tank for durability and reliability and they like their work.

Before the *XM-1* test began, Company H was an *M-60A2* tank unit supporting routine U.S. Army Armor School instruction. Now they consider themselves an elite organization with a mission that is vital to the nation's defense. They are a proud bunch!

"It's a source of real satisfaction to be involved with the *XM-1* test," says Staff Sergeant Steven J. Gomez, tank commander. "That's why you don't hear many complaints about long hours—longer hours than those worked by the drill sergeants here at Fort Knox."

Corporal Steven J. Crocket, an *XM-1* loader, thinks participants in the test have a special responsibility. "I feel like we represent all Army tankers, and we have to do an especially good job of shaking down the tank. Letting experienced tankers do the test was definitely a good idea," he adds.

Members of Company H are particularly pleased that they have been asked for recommendations for improving the tank and that the agencies involved in the test have listened carefully to their comments and have made some changes as a result.

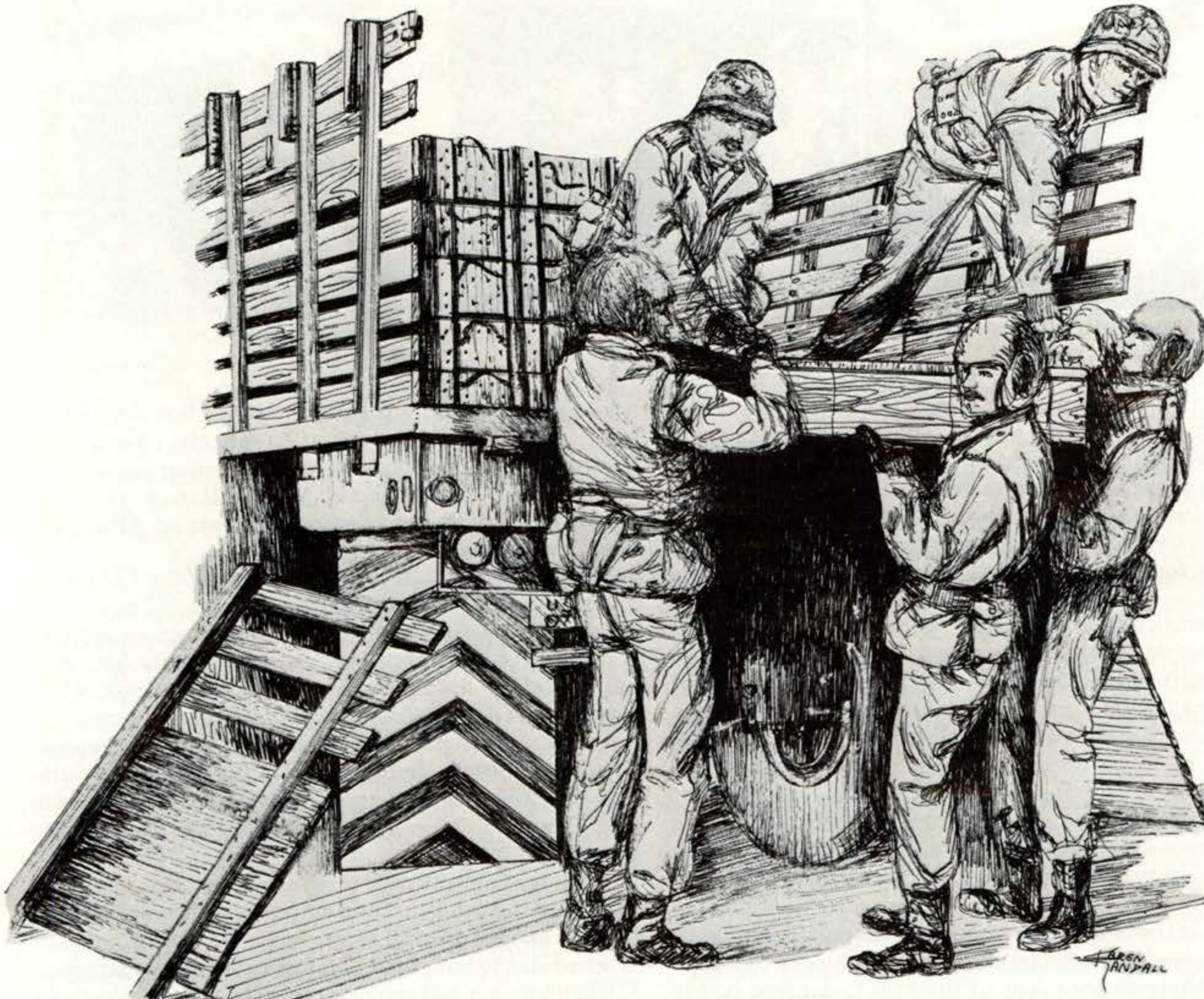
And how do the tankers themselves rate the *XM-1*? The best! For instance, SGT Linas J. Lapinskas says, "I'm still amazed at the smoothness of the ride cross-country and as a gunner that means more hits for me when I shoot on the move." All of the men involved in the test agree that they are excited about the tank and would not hesitate to ride the *XM-1* into combat.

The Company H tankers all agree on another aspect of their operation—visiting VIPs and newsgathers. They have met and talked with the Secretary of the Army, the Chief of the Staff of the Army, and scores of general officers. They also have performed before TV cameras, including those of ABC's 20/20 production staff. One tank commander sums up the unit's reaction to these activities this way, "After you meet the first few VIPs, the novelty definitely wears off. But, I guess its all a part of being involved in a special project."

The tank commander could have added, ". . . and being in a special unit," because Company H is just that—it is the first *XM-1* tank company in the U.S. Army.

And the company will continue to be involved in a special project when they participate in OT III of the *XM-1* later this year.

Highlights of the Operational Test Plan for OT III will appear in a later issue of ARMOR. Ed.



Ammunition Resupply

By Captain Thomas G. Pratuch

Resupply of various supply classes can generally be measured in hours, even days in some cases. Yet there is one item that will be consumed in minutes—ammunition. The problem of rearming a unit following a battle is, without a doubt, one of the most discussed topics within the Army. Ironically, it is one of the least exercised areas in logistical operations. On ARTEPs, the problem of ammunition resupply is simulated by slips of paper and several 105-mm ammunition boxes containing parachute flares, blank ammunition, and smoke grenades.

The only opportunity for a unit to experience near-realistic problems with large-scale ammunition movement is found during gunnery, when the scope of the problem is a function of the amount of firing to be done per day and the time interval between ranges. Compare the gunnery experience of any unit to the data in chart 1 derived from FM 101-10-1. How many units have gunnery cycles that expend 78 rounds of 105-mm per tank in one day? (Readers wondering why the data for the defense was used will find that FM 101-10-1 has lower consumption figures for the offense.)

In discussing resupply of ammunition certain starting assumptions must be made:

- Ammunition resupply will be done from a point in the brigade trains area. The brigade trains will be located 20 kilometers behind the forward combat units.

• All calculations will be based on a full-strength armor battalion (TO&E 17-35H). Any allowances for combat losses will have to include losses of supply vehicles. Such losses will be proportional (if 10 percent of the combat vehicles were lost, an equivalent loss in trucks will occur), thus having little impact on the resupply calculations.

• The commander will utilize all available vehicles to move ammunition (two 5-ton trucks, five 8-ton GOERs and five 2½-ton trucks). The company supply trucks would be occupied with carrying company needs, water, C-rations, augmenting medical evacuation, POW transportation, etc.

The first step, after finding out the amount of ammunition to be moved, is to determine the battalion's haul capability. Chart 2 presents the approximate cargo capacity for the trucks currently found in armor battalions. There is some variation in values for differing models, but the variation is not significant in this discussion. The column labeled *Optimum Cargo Density* presents the minimum values for packed ammunition so that the truck cargo will be limited by weight restrictions. If the ammunition packing creates a lower density value than those presented, then the truck cargo capability will be wasted.

Data on ammunition packing and the corresponding density value for differing methods can be found in the ammunition supply catalogs. The data for the ammunition types selected in chart 1 is presented in chart 3. Nonpalletized packaging values are used because pallets lower the amount of ammunition loaded significantly.

Optimizing the cargo loads is now a matter of selecting the ammunition, based on density, to meet or exceed the optimum cargo density values for the truck(s) used. But before the "optimum load" can be discussed, a method must be found to load the ammunition. Since palletized ammo reduces the load, manual labor will be needed. Experience in ammunition moving has shown that a minimum of four men are needed for each truck to be loaded.

Obviously, a large number of men cannot be expected to be available. Neither can it be considered sensible to be loading one truck at a time. A reasonable trade-off would be to have the ability to load five of the vehicles at a time. This would require 20 men. There are 12 "passenger" slots on the vehicles being utilized. The remaining eight men must ride in the back of one of the trucks.

It would not be wise to use the truck drivers to load the ammunition. Later in this article it will be seen that they will spend a considerable amount of time in driving the trucks. Additionally, someone will need to supervise the loading operation, and rather than adding an NCO to the group, it would be easier to make the driver responsible.

The truck-haul capacity total is now 124,000 pounds for cross-country movement or 160,000 pounds if all movement is done on roads. One 2½-ton is being used to carry the additional men. The assumption has to be made that all movement cannot be conducted on roads.

The resupply operation will not be conducted properly if any one type of ammunition is allowed to occupy a disproportionate amount of cargo capacity. For example, if the number of rounds of ammunition involved were to be used for establishing priorities, machinegun ammunition would top the list. Therefore, weight is the best criteria, and chart 4 presents the expenditure percentage by weight for each ammunition type used in this discussion.

These data have several additional pieces of information when examined. The trucks will be lifting approximately 35 percent of the planned expenditure. No consideration has been made for engineering demolition material, mines, LAWs, or small arms ammunition. The Improved TOW Vehicle (ITV) *M-901s* will receive approximately five rounds each, or one-half of their on-board capacity of 10, plus two in the launcher. The tanks will receive 27 rounds or roughly 43 percent of their on-board storage. The men used to load the am-

Chart 1: Ammunition Expenditure, First Day in the Defense

Weapon Type	No. of Wpns. (TO&E 17-35H)	No. of Rnds Used Per Wpn.	Total No. of Rds Expended	Percent Ammo Expended (by wt)
Dragon	3	6	18	0.3
TOW	4	16	64	1.4
4.2-in Mortar	4	163	652	7.3
Machinegun (Note 1)	114	3,184	362,976	14.4
105-mm	54	78	4,212	76.6

Note 1: This row accounts for the .50 cal and 7.62-mm machinegun ammunition in the battalion.

Chart 2: Truck Cargo Capacity

Truck	Cargo Vol. (cu ft)	Cargo road	Capacity (lbs Cross-country	Optimum Density Road	Cargo (lbs/cu ft) cross-country
2½-Ton	273	10,000	6,000	37	22
5-Ton	389	20,000	10,000	51	26
8-Ton (GOER)	403	16,000	16,000	40	40

Chart 3: Ammunition Packing Date

Ammo Type	Weight (lbs)	Volume (cu ft)	Rds/Pkg	Density lbs/cu ft)
Dragon	67	7.0	1	9.6
TOW	80	4.5	1	17.8
4.2-in Mortar	80	1.5	2	53.3
Machinegun (Note 1)	68	0.9	484	75.6
105-mm	130	3.3	2	39.4

Note 1: The data is averaged for the 7.62-mm and .50 cal machinegun ammunition.

munition will remain at the brigade ammunition point until all lifts have been completed. This avoids reducing the truck cargo capacity.

The scope of the problem is now becoming apparent. Even if all five company trucks are available, there is only a 19 percent increase in cargo capacity. This means an additional 282 tank main gun rounds, 1 *Dragon,* 4 TOWs, 43 mortar rounds and 24,543 rounds of machinegun ammunition. Another way to put it is that each tank will receive an additional five rounds. It will still require three lifts to replace all the ammunition.

Someone will want to point out that two lifts will fill the combat vehicles. Essentially this is true—but where did the extra ammunition to fire during that first day originate? Scrutiny of the planned tank expenditure shows 15 more rounds fired than an *M-60A1* carries. This means that an initial lift of ammunition, accounting for the additional rounds of all types, will require all the dedicated ammunition vehicles to start with. Again, no allowance has been made for small arms, etc. Basic loads directed for organizations by current regulations require a wide variety of additional ammunition to be carried in the cargo vehicles. Therefore, additional ammunition required for the planned expenditure cannot be considered to be available in the unit basic load. So, the first day resupply will have to contain some of the ammunition planned for expenditure.

Prestocking of ammunition might be possible, but the topic requires a discussion beyond the scope of this article. Briefly, prestocking means that consideration has to be given to available time before the "first day" battle, the planned progression of the battle, and how to protect the storage locations.

The last step in planning the movement is allocating the ammunition in the vehicles. Using the cargo density values, we find the GOER cargo trucks to be best choice in moving 105-mm and mortar ammunition. The 2½-ton trucks are closest in optimum density to the packed TOW, and careful use of the high density machinegun ammunition can bring the overall cargo load in each truck to an optimum density. A similiar mix of *Dragons* and machinegun rounds will utilize the truck capabilities to their best advantage. The two 5-ton trucks will carry any type of ammunition that cannot be placed on the other trucks.

At this point, the planning of the am-

Chart 4

Ammo Type	Portion of Load Based on Expenditure (lbs)	No. Rounds (fractions dropped)	Actual Load Weight for No. Rounds (lbs)
Dragon	372	5	335
TOW	1,736	21	1,680
4.2-in Mortar	9,052	226	9,040
MG	17,856	126,808	17,816
105-mm	94,984	1,460	94,900
Totals	124,000		123,771

munition movement has been completed. However, there are several areas in the planning phase that can be expanded into separate discussions. Some of these are: the type of vehicle suitable for ammunition resupply (armor? cargo capacity?), techniques for easing the loading of ammunition, the most suitable way for delivering ammunition to the users, and unit TO&E adjustments that should be made. However, there is only one area to be presented in this article—the time requirement for resupply within the planning figures used in this article.

To ease the discussion, the theoretical armor battalion will be considered to have one lift on the cargo vehicles in the battalion trains. A lull in the fighting allows the ammunition to be brought forward giving the combat vehicles the additional ammunition that they will expend plus a partial start on actual replenishment. What will now be found is the time it will take to bring the vehicles back to their storage capacity.

The trip from the front units to the brigade trains was given as 20 kilometers. The first idea that occurs is to split the trucks into two groups—GOERs travel after the 2½- and 5-ton group. The 2½- and 5-tons will be able to travel faster than the GOERs on the roads used as the supply route. (The loads still have to be planned for cross-country movement because it may not be possible to use roads in moving close to the companies for resupply.) The trucks travel at a speed of 40 kmh, completing the trip in 30 minutes; while the GOERs, moving at 24 km/h, will take 50 minutes. Since the loaders have their experience with the first lift to aid in arranging the cargo loads, there should not be any surprises. So, loading time should be a matter of the men's speed. The exact time that loading will require does vary, but a time of 30 minutes is reasonable. At this point, the first five trucks with *Dragons,* TOWs, and machinegun ammunition can now start back. The staggered schedule of trucks arriving back at the combat vehicles is shown in chart 5.

Chart 5

Elapsed Time	Incident
0:00	All vehicles to ammunition point (trains).
0:30	The first seven trucks arrive at the ammunition point (trains).
0:50	GOERs arrive at trains.
1:00	Five trucks depart trains.
1:30	GOERs depart trains—five trucks are at companies.
1:45	Remaining two trucks depart trains.
2:20	Five trucks arrive at trains and five GOERs arrive at companies.
2:40	GOERs and two trucks leave combat units for trains.
2:50	Five trucks leave trains.
3:10	Two trucks arrive at trains.
3:30	Five trucks arrive at companies, GOERs arrive at trains, and two trucks leave trains.
3:50	Loading of five trucks completed.
4:00	Two trucks arrive at companies and GOERs depart for companies.
4:50	GOERs arrive at combat units.
5:10	GOERs finish offloading.

Notice that it took 5 hours to replace the ammunition. Offloading time of 20 minutes was allocated at the company areas. This meant that the companies were able to provide manpower to offload at a central ammunition point. If the trucks were required to go to individual vehicles or move between companies in order to deliver the rounds, this planning time could only increase. The trucks have been considered as being able to pass each other as necessary on the supply route, nor were they considered as being subject to attack and forced to deploy. Had they been attacked, the planning time would have increased.

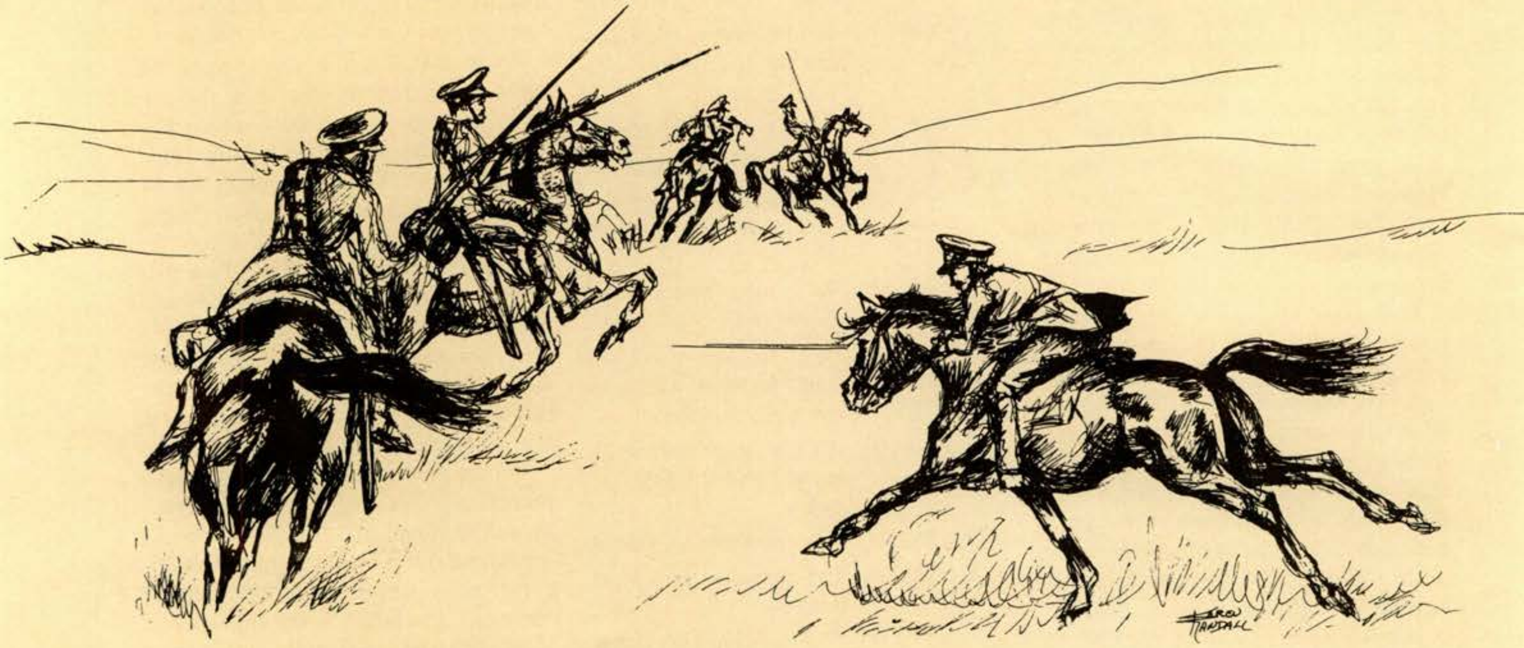
The figures given have been based strictly on driving and loading/unloading times. It has been common to discuss "company slices" of logistical support. Trying to plan the loads, even for the balanced expenditure (each company fired one-third of the ammunition total after subtraction for scouts and battalion HQ tanks) used here, would increased the resupply time.

In this case, the increase would be small because the S4 had knowledge prior to the expenditure. But what would be the increase where one company is firing ammo at twice the rate of the other two? This data would not be available in time to use efficiently the support assets. It seems logical to simply load trucks to their maximum and divert them as necessary to the companies.

As in planning the loads, there are other considerations than those discussed here. What impact does vehicle loss (combat and cargo) have on the times for resupply? What allowances can be made for ammunition available in the battalion trains by locating it on the ground for the trucks to bring forward? What impact will the *XM-1* have on this resupply operation? These are only a start. If an attempt was made to answer all of the questions raised in this article, this magazine could be filled. It would also be presumptous to try to do so.

But the purpose of this article is not to present a set answer to logistical problems. The intention is to define the problem found in logistical resupply. As Captain Drebus pointed out in "Unchained Mobility" published in the July-August 1979 ***ARMOR,*** current literature pays only token service to logistic operations. It is necessary for the units that have to live with the supplies being sent to define their needs. They must also express their concepts for conducting supply operations.

CAPTAIN THOMAS G. PRATUCH was commissioned in Armor from Rochester Institute of Technology in 1974. He served as a tank platoon leader and support platoon leader while assigned to the 1st Bn, 68th Armor. Recently graduated from AOAC, CPT Pratuch is assigned to the 1st Cavalry Division, Ft. Hood, Tex.



12th Lancers At Moy

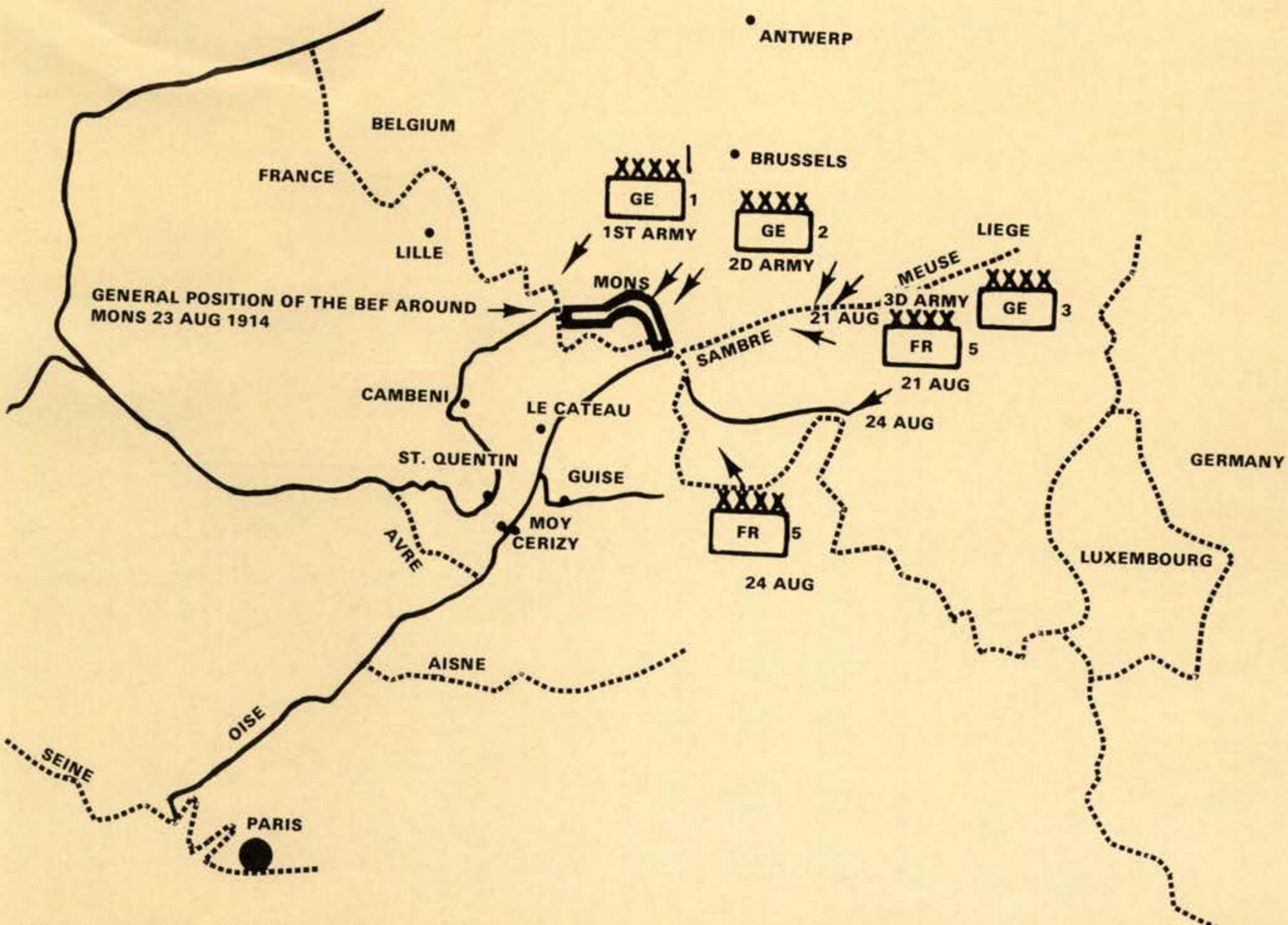
by Captain Douglas S. Aykroyd

On the 28th of August 1914, the British Expeditionary Force (BEF) was engaged in the Retreat from Mons. On the right flank the 5th Cavalry Brigade, covering the retreat of the 1st British Corps, waited in positions near Moy and Cerizy as two German cavalry brigades approached. The battle fought there, culminated by the charge of the 12th Lancers, was described by General Sir Hubert Gough as "a model action, illustrating the combination of fire and shock, use of ground and surprise."[1] The battle is important to us today because of the comparisons that can easily be drawn between the situation of the BEF and what U.S. forces might expect in a conventional war in Western Europe. It demonstrates that a well-armed, but outnumbered, force can successfully use offensive operations in the course of a defensive campaign. It further shows that proper use of terrain and isolation of enemy elements are the key to the successful use of the offensive.

The BEF, consisting of four infantry divisions and one of cavalry, moved to France on the 12th and 13th of August 1914. It was an all-volunteer force, well-trained, well-led, and well-armed. In spite of the initial confusion and numerous changes of mission, the morale of the soldiers remained high. By the 22nd of August, the British 2d Corps was in position north and west of Mons, while the 1st Corps was moving to fill the gap between the 2d Corps and the French Fifth Army to the east. The 5th Cavalry Brigade, consisting of The 2d Dragoons (Royal Scots Greys), 12th (Prince of Wales's Royal) Lancers, the 20th Hussars and J Battery, Royal Horse Artillery, had the mission to fill in the gap in order to allow the 1st Corps to move unhindered into its positions. Early that day the first elements of German cavalry patrols probed the brigade front. On the morning of the 23d, the full weight of the German attack fell on the BEF and especially on the 2d Corps. The 5th Cavalry Brigade held firm against the sporadic probes while the 1st Corps completed a forced march into position.

On the evening of the 23d, the BEF was firmly in position and had blunted the strong German attack in the 2d Corps area in spite of an enemy superiority in men of 335,000 to 87,000. The Fifth French Army on the right flank, however, was in retreat. General Sir John French, commanding the BEF, advised his allies that he would hold his position for 24 hours and then commence a rearward movement to keep in line with the Fifth Army. The First Corps, having just completed a long forced march into position, was in no condition to conduct a quick-paced retrograde operation, so the 5th Cavalry Brigade was given a rearguard mission, while the 4th (Guards) Brigade screened the Corps' east flank.

[1] Hendemann, Kurt. *Die Schlacht bei St Quentin 1914.* Gerhard Stalling Verlag, Berlin, 1929. Page 9.



On the morning of 25 August, the 5th Cavalry Brigade began its rearward movement leaving behind small ambushes and patrols to keep the enemy off-balance, slow his march, and reduce the effectiveness of his reconnaissance operations. By the afternoon of the 28th of August, the Brigade had covered 100 kilometers and was in position along the road between Cerizy and Moy.

The Germans were well pleased with the conduct of the war in the west. Belgium was occupied, the French offensive into Germany had been crushed, and the allies were falling back all along the front. General Alexander von Kluck's headquarters telegraphed Berlin on the 28th, "The English Army has been completely defeated north of St. Quentin. It is in complete retreat through St. Quentin."[2] A German victory seemed to be within reach.

Early in the afternoon of the 28th, German patrols reported the presence of British cavalry and artillery in Urvillers. The 1st and 3d Guard Uhlan Regiments, two batteries of artillery and a machine gun section were sent to fix the enemy in Urvillers while the 3d Guard Cavalry Brigade (1st and 2d Guard Dragoon Regiments) was sent to the east in a effort to outflank the British. However, the Germans were operating on stale information. The 5th Cavalry Brigade had been deployed along the Moy-Cerizy road since before noon. The 20th Hussars were in the vicinity of Cerizy, the Greys were deployed east of La Guinguette Farm, J Battery was behind the Greys, and the 12th Lancers were in reserve near Moy.

About 1600 hours, three squadrons of German Guard Dragoons (two from the 1st Guard Dragoons and one from the 2d) rode into view from the north. A squadron of the Greys was dismounted in the woods around La Guinguette Farm and 500 meters to the northeast. From these positions, the squadron had excellent fields of observation to the north. Furthermore, any approaching enemy would have to cross the east-west valley and fight uphill before reaching its concealed position.

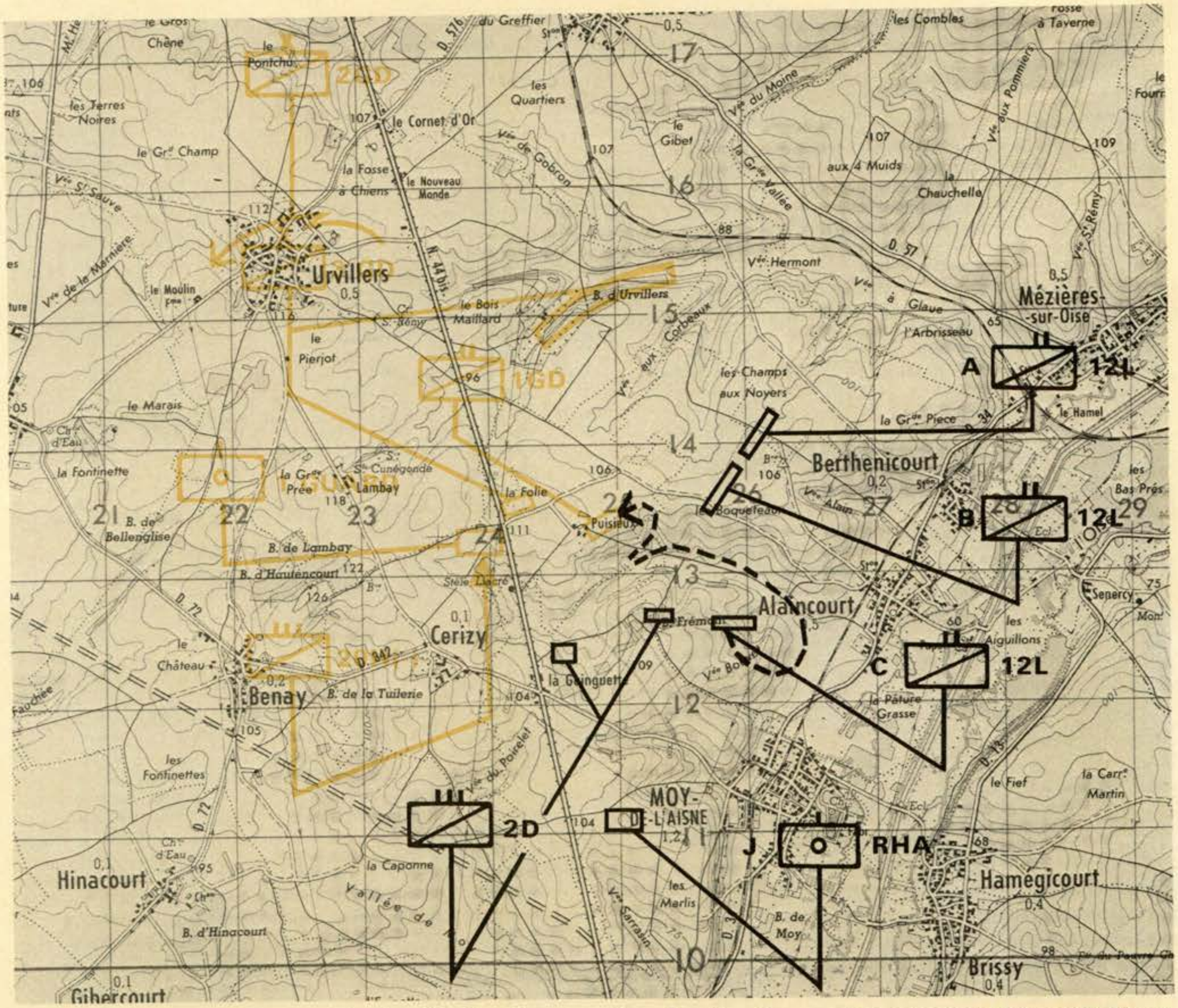
As the lead squadrons closed within 500 meters, the Greys opened fire, supported by two machine guns and a section from J Battery. The Germans dismounted to return fire; however, they had no cover, and little concealment was offered by corn shocks. As the fire intensified, the lead horses stampeded, and the Germans moved back up to the crest of the hill toward the northwest.

C Squadron, 12th Lancers arrived, along with the two regimental machine guns and added additional fire to the fight. Lieutenant Colonel Frank Wormald, commanding the 12th Lancers, directed that A and B Squadrons move to establish a dismounted attack on the German's east flank.

The commander of the 5th Cavalry Brigade, Brigadier Sir Philip Chetwode, ordered the 20th Hussars to move forward on the west flank of the Germans, while two squadrons of the Greys were sent to support the attack of the 12th Lancers in the east. The fires of J Battery were expanded to include the wooded areas north of the Germans where the two remaining enemy squadrons were sheltered. Several attempts by the other squadrons to assist were driven back. The dismounted Germans were, in effect, cut off from the outside assistance.

After fires from A and B Squadrons were effectively placed

[2] Steward, P. F. *History of the XII Royal Lancers.* London, 1935. Quote by Sir H. Gough, page 35.



on the Germans, Colonel Wormald ordered C Squadron to move back to the horses and then to move to better position. He directed the adjutant to make a reconnaissance of the area between C Squadron and the positions being occupied by A and B Squadrons in order to select a better position and route to it.

The three remaining squadrons of the German 2d Guard Dragoons appeared and attempted to assist the dismounted squadron from the 1st Guard Dragoons. However, fires from J Battery and the dismounted British drove them off the field with heavy losses.

Colonel Wormald was moving with C Squadron to the new position when the adjutant returned from his reconnaissance and advised him that, due to the slope of the hill the Germans held, it would be possible to approach within 50 meters of the enemy without being seen. This offered Lieutenant Colonel Wormald the chance to destroy the German dragoons with one quick attack. The tactical maneuvering being accomplished was sound, but it was impossible to predict how much time would elapse before overwhelming German forces might either force the British back or, more seriously, catch them in a dangerous position.

Lieutenant Colonel Wormald moved C Squadron up the valley to the west. As they approached the German position along the ridge, the squadron came under heavy rifle fire, so Lieutenant Colonel Wormald moved them down the hill and 300 meters to the east. This time the Lancers were in position for the attack. As the squadron reached the crest of the hill, it formed "on line." "Gallop" and "charge" were sounded. The surprise, combined with the shock of the attack, almost negated any effective resistance on the part of the Germans. Although Lieutenant Colonel Wormald was wounded and Captain Mitchell, the squadron commander, was killed, the Lancers, now supported in the attack by two mounted squadrons from the Greys, reformed and rode through the Germans again. By the time the Lancers covered the ground for the third time, it was undefended because the majority of the Germans were either killed or wounded. Under the cover of J Battery and the rest of the brigade, C Squadron recovered its casualties and prisoners and moved back to the Moy-Cerizy road.

Meanwhile on the brigade's left flank, the 20th Hussars (-) were moving north of Cerizy. As the lead troop approached La Folie Farm, a battery from the German 1st Guard Field Artilley Regiment was discovered. C Squadron dismounted and took the battery under fire in order to divert attention from B Squadron, which was moving to attack the battery's flank, and to divert fires from the rest of the brigade. Although the

ground precluded an attack by B Squadron, the 20th Hussars were successful in preventing the German battery from having a decisive role in the battle.

The total losses of the 5th Cavalry brigade were 43 casualties. Of those, C Squadron, 12th Lancers accounted for four killed and six wounded (including LTC Wormald). The German 3d Guard Cavalry Brigade had losses which were estimated to be two to three hundred. At least 70 were killed or wounded in the charge.

The 5th Cavalry Brigade broke contact and moved south to continue its mission while the German 3d Guard Cavalry Brigade withdrew to reorganize and recover from the British attack, which in about 20 minutes gave the 1st Guard Dragoon Regiment more casualties than they sustained during the rest of the first year of the war.

The situation of the British Expeditionary Force in August 1914 can easily be compared to that of U.S. Army forces in Europe today. We are a well-equipped, all-volunteer force prepared to fight outnumbered a well-trained, well-armed adversary, and still win. While we are waiting for forces to move to Europe from our home bases, we will assume a defensive position. The most valuable asset available to us which was not available to the BEF is time. We have had years in our defensive positions to their hours.

There are three important lessons brought out by the success of the Battle of Moy-Cerizy. First, we can never let the conduct of a defensive operation hide the role of offensive operations as a part of the defense. Opportunities for attacking limited objectives will present themselves and must be fully considered. An advancing enemy stung by a successful attack is prone to move more carefully and, therefore, more slowly. As a result of the British success at Moy-Cerizy, there was no German advance for 4 hours.

Second, while fighting outnumbered, it is important to make the most of every opportunity to isolate enemy elements and destroy them before reinforcements can assist. Use of smoke and indirect fires to prevent observation or intervention by follow-up enemy forces will enhance the positions of the defender and give the defender a wider range of possible courses of action including the attack. The fires of J Battery kept five squadrons of cavalry out of the battle and thus gave the 12th Lancers the time needed to conduct their attack.

Finally, the importance of terrain must be fully recognized. There is no substitute in war for an intimate knowledge of the ground. The key to the success of the whole attack at Moy was the reconnaissance made by the adjutant, which revealed the importance of the dead ground between the Germans and the British. Without this knowledge, a swift mounted attack would have been impractical and surprise impossible. In 1917, while defending in this area, the Germans established a strong point on the ridge northwest of Alaincourt to provide observation in the valley to Cerizy. Having had time to recognize the importance of the dead ground, the Germans took corrective action to preclude future surprise. The time we have available to us in Europe must be used to familiarize leaders at all levels with the ground on which we intend to fight in order to maximize its advantages and take any necessary steps to negate any weaknesses created by terrain. Furthermore, the study of GDP areas provides the best sort of classroom to teach terrain appreciation. Those lessons learned by spending a great deal of time on GDP areas will enhance terrain assessments made when less time is available.

ORDER OF BATTLE

British

5th Cavalry Brigade
- 2d Dragoons (Royal Scots Greys)
- 12th (The Prince of Wales's Royal) Lancers
- 20th Hussars (two squadrons only)
- J Battery Royal Horse Artillery

The British cavalry regiments were organized with three combat squadrons. The individual trooper was armed with a short magazine *Lee Enfield* rifle and the *Model 1908* saber (similar in design to the US *M-1913* Patton saber). Additionally, lancer regiments were armed with the lancer. The strength of a regiment in 1914 is illustrated by the 12th Lancers who on the 16th of August had 25 officers, 523 other ranks, and 608 horses. A British cavalry brigade was organized with three cavalry regiments.

German

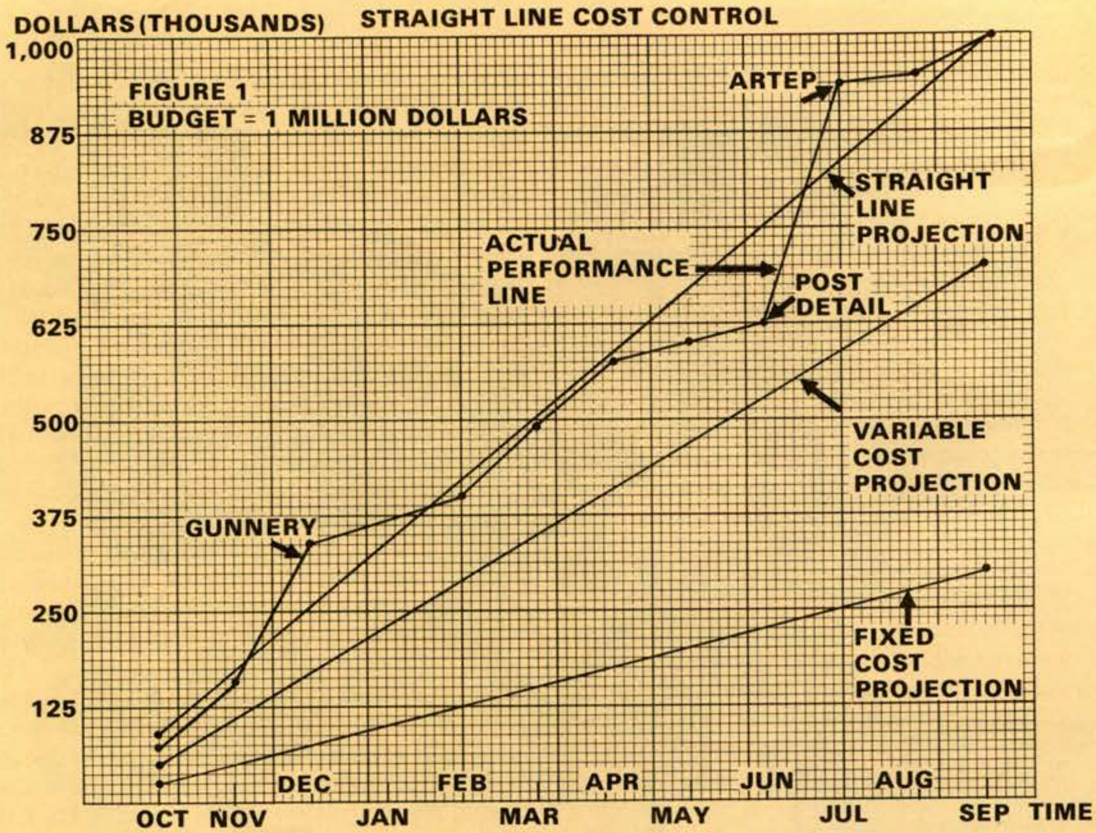
2d Guard Cavalry Brigade
- 1st Guard Uhlan Regiment
- 3d Guard Uhlan Regiment

3d Guard Cavalry Brigade
- 1st Guard Dragoon Regiment (Queen Victoria of Great Britain)
- 2d Guard Dragoon Regiment (Empress Alexandra of Russia)

1st Guard Field Artillery Regiment

The German cavalry regiments were organized with four combat squadrons. The individual trooper was armed with an *M-1898* Mauser carbine, the *M-1898* saber, and a lance. The strength of a regiment was 730 men and 800 horses. Of these, 600 men were in combat positions. A German cavalry brigade was organized with two cavalry regiments.

CAPTAIN DOUGLAS S. AYKROYD was commissioned in armor upon graduation from the US Military Academy in 1969. He has served with the 40th Armor, Berlin Bde; 2d Sqdn, 6th Cav; 5th Bn, 33d Armor; and 2d Bn, 32d Armor. A graduate of Armor Officer Advance course and Rotary Wing Aviator course, he also served with the 62d Avn Co in Vietnam. He is currently commander of Company A, 2d Bn, 32d Armor.



mand and subtract the fixed cost. This is the money available to perform training at the commander's desired level of training or to perform the mission in the style the commander desires. Obviously, the training standards must be met and the missions accomplished. It is at this point the commander undertakes some further analysis.

The first action taken by the commander to influence the money left to do the training and operational missions is to make the budget estimate, which includes fixed and variable costs. The key input to this estimate is it must meet requirements. The commander must sit down with his staff and fully define requirements for dollars spanning 6 to 8 months in the future. The training factor is not too dificult to calculate as the commander can visualize what training standards must be attained by his units. The standards are then translated into days of training events required to meet the standard. These days are then translated into events that are to be performed supporting the attainment of training standards. The events are then costed out by vehicles through mileage calculation and other equipment hourly usage.

Indirect costs such as expendable supplies, organizational clothing usage, and equipment usage then must be calculated into the event. The indirect cost has many variables—status and age of supporting equipment, climate, terrain, and type of training event. These indirect costs are not precise, but a commander must take into account these factors that are operable in his local area. For instance, heavy spring mud at Fort Knox means something quite different in cost terms than rainy weather in Germany. Further, the hot, dry, rocky climate of Fort Hood in the summer is very different than the hot, wet, marshy ground of Fort Stewart in cost significance. Every commander's status of equipment will very based on age, previous maintenance records, previous parts deferral, and management expertise.

Once all these sums have been added up from the training events, the cost of meeting the unit's training standards is known. The next step is to determine from higher headquarters the operational missions that the units must meet. Some examples of this are contingency planning, FTXs, JTXs, CPXs, troop tests, demonstrations, and post support missions. As the analysis of training was detailed by event and then the event was broken down by cost occurrence by weapons and supporting system, so the operational missions must be appraised.

The requirements for operation and training are then added together to give the variable cost amount. This figure plus the fixed cost figure produce the commander's budget estimate to meet his mission. At this point, there are some cautions to be added by the commander. First of all, on the average 18-month command tour, *your budget,* if you are lucky, will cover at the most 11 months of your tour and if you are not so lucky, only 2 or 3 months of your command. Also, higher headquarters must provide funds if additional missions are required by the unit.

At times, the fighting gets very heavy to achieve this feat. However, in today's Army, money and mission must be handed to the subordinate commander simultaneously. The key point is that you cannot expect a battalion commander to run out a reinforced team unless you provide him the funds. Otherwise, the budgeting and control process at the operative level becomes meaningless to that subordinate commander.

The other caution is a requirement that will appear *after* the budget estimate is submitted. Generally, it is in the form of change in TO&E or TDA authorization, or an addition to a tool set or additional component for an end item. These cannot be funded from the budget estimate. When these changes occur, the commander must submit a request for supplemental funds. If the funds are not available, then the additions have to be deferred to the estimate in the following year. At troop level, these cautions boil down to the fact that additional requirements on top of the budget estimate require additional funds.

Finally, around the 15th of September you will usually receive your fund allocations for the year. They will generally be quite less than what you stated as the unit's requirement. The commander must then analyze with his commanders and staff his fund allocation to see what trade-offs are possible after the fixed costs are deducted. The fixed cost must be treated by the commander as fenced money, i.e., not to be added to the training and operational event money. Usually, some tradeoffs can then be addressed in general terms. Also at this point, the command will discover it cannot meet its training and operational requirements.

At this time, a commander must meet with his next commander in the chain of command and point out to him those training standards that may have to be reduced, those operational missions that cannot be accomplished in the manner prescribed, and those additional equipment requirements that cannot be purchased (if known at this time). The higher commander then will come back with a priority list of training and operational requirements.

The commander then addresses his staff with the guidance that he has received and identifies trade-offs or techniques that can be used to meet his commander's guidance. This is the critical point in a commander's tour. The cost of items is fixed or increasing (depending on inflation); therefore, the only answer is in cost-reducing the training or operational events. Cost avoidance obviously can be attained by not performing an event. In some cases, this is acceptable. However, if the higher command has indicated that the event must take place, other means of meeting the guidance must be found.

In the area of training, several trade-offs are available. If an ARTEP must be performed, the level can be reduced for a cost offset. If that cannot be done, then game simulation can be used. Perhaps the game of *Firelight* with some sandtable exercises can be substituted for platoon ARTEPs, or the game *Dunn-Kempf* can be used at company level.

At levels of maneuver training, TEWTs can be used as a cheap route to tactical proficiency. In the case of tank gunnery, greater use can be made of the mini-tank range, conduct of fire trainers, or the use of close-in training areas. Another possibility is hauling tanks to ranges on heavy equipment transporters. In the case of artillery units, greater use of the *M-31* range would be acceptable. With imagination, skills training that does not require the moving of armored vehicles can be done in the motor pool. In summary, many training events can be accomplished using less expensive equipment methods, and areas. The key question is always asked—will it be as good as the more expensive method? The answer is probably no, but the training objective and standards can be met, and that is the primary goal. Operational events are a greater challenge in effecting cost reductions. One of the first options to the senior commanders is the reduction of the size of the participating force. It is possible for a reinforced tank company to suffice for a reinforced battalion in a demonstration. FTXs, JTXs, and CPXs must be examined to see if force reduction is required to stay within cost parameters. The area for a CPX could be the motor pool as opposed to moving the whole headquarters to a distant field location. The length of field problems can be reduced through integrating exercise objectives instead of viewing them as separate events.

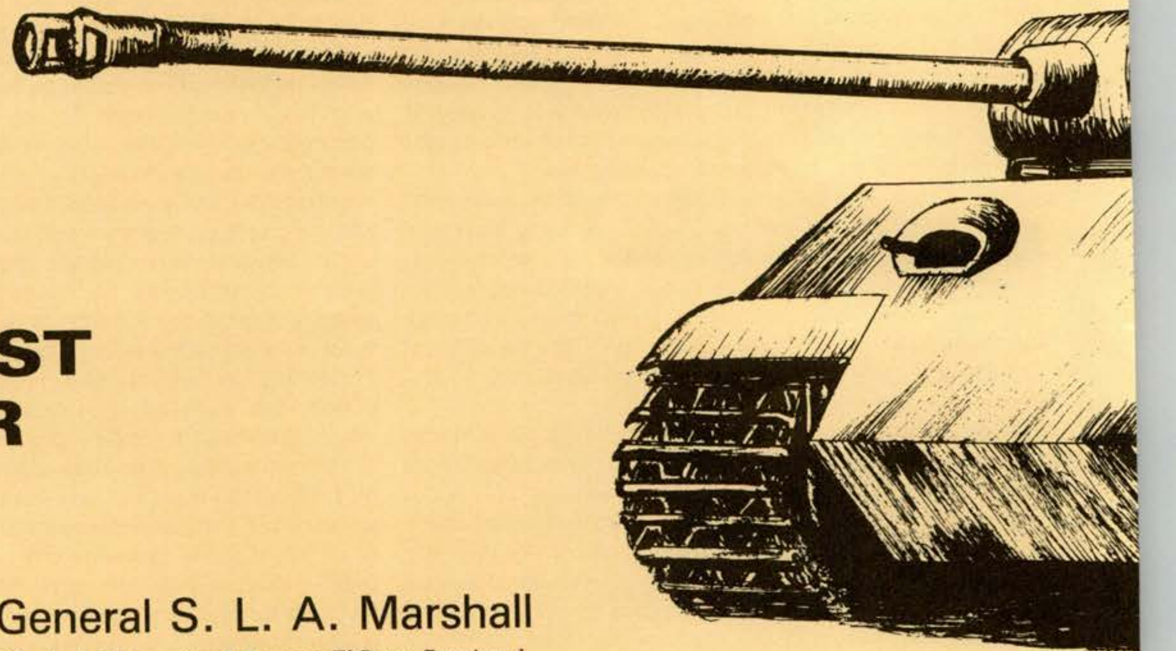
Training for readiness exercises can be done cheaper by using a type of load per vehicles classification instead of loading all vehicles. For the commander using his imagination, there are many trade-offs that can be used to reduce cost of operational events. The key factor is identifying the problem early and then working on cost reduction so that the exercise or mission objectives are met.

As the fiscal year progresses and the months roll by, the commander must periodically review where he stands in relation to his program and what cost occurrences he must deal with in the remaining months. Though unscientific, the best troop-level method for measuring battalion, brigade, and division fiscal performance is the straight line method. Theoretically, the rate of spending should be uniform throughout the year. Obviously, the training and operational events are not uniformly scheduled, but the fixed costs probably are steady through the year. The commander must be the one to decide to vary from the straight line. Due to certain parts of the year being heavy event-periods, he must underspend in order to stay a in straight line. A rule of thumb is that a deviation greater than 5 percent is the commander's call. Preplotting the year ahead is helpful in highlighting those periods that must be low-cost occurrences. Again, a key point—spending for fixed costs is continuous (figure 1).

The commander, even after applying all of the above tips, may still hit bad times and have less than the required funds to accomplish his training and operational events. The first area of savings that will look attractive is to go into a constrained supply status. Then, the next thought will be to defer maintenance and only perform that repair work that renders equipment noncombat ready or is a bad safety item. Both of these actions are legal considerations by the commander. However, there are some pitfalls. If he defers maintenance or constrains supply, he will have to buy the items needed in the next fiscal year. In today's budgets, this means that trade-offs for the next year will be severe. If forced into this situation, the commander must tell his higher headquarters that his capabilities will be reduced. Too often, these courses of action are chosen because it is hoped that the following year may bring additional funds. In today's environment of constrained resources, those funds are not forthcoming.

The area of planning, programming, and budgeting below installation level at the troop level is not covered by detailed instructions. These thoughts presented on budgeting at the troop level are not unique, exclusive, brilliant, or regulated. They are a view of the real terms of a troop commander dealing with funding at "the trench level" in today's fiscal environment.

COLONEL JOHN D. BORGMAN, Armor, is currently assigned as commander of the Lightning Brigade, Fort Knox, Ky. He was previously assigned as Chief of Staff of the 2d Armored Division. He has served with units in Korea, Germany, Vietnam, and CONUS, where his assignment included platoon leader, company commander, and various battalion brigade and division staff positions. He is a graduate of the Command and General Staff College and Industrial College of the Armed Forces.



MAN AGAINST ARMOR

by Brigadier General S. L. A. Marshall

I would suggest the worthwhileness of questioning the moral power of line infantry to stand in place and fight armor, instead of taking it for granted, after a cursory examination of World War II and more recent experience, that infantry is equal to the task provided that it is organically equipped with tank-stopping weapons.

Today the committees at Fort Benning would probably take a quite positive and optimistic view when asked the question and might even commonly agree that of late years the problem has altered dimensionally in favor of the foot fighter having a main chance to check and turn tanks in the attack if he has been adequately trained and is soundly deployed. The appearance and proved combat effectiveness of such weapons as the TOW and *Sagger* missiles that can kill tanks at the maximum ranges where Armor *en masse* threatens the eruption and dispersion of the combined arms in the defense superinduces a degree of euphoria as to future possibilities. That in itself is not a minus, since confidence in one's weapons out of realistic training is the prime insurance of their optimum battlefield use and there is no other guarantor of ultimate success in war.

New weapons, however, do not of themselves revolutionize warfare, though they may seem for a time to have that effect, which history attests as a recurrent illusion. The one constant that remains changeless in human nature and its first law—that of survival. Another dominating factor is the harshness of earth's surface, the lack or scarcity of viable protective cover in the hour when nothing else will afford a steadying influence.

True, there are numerous instances out of World War II and Korea where armor was stopped dead mainly by fire from infantry elements. There are like examples from the Yom Kippur War, particularly in the fighting on the Golan Plateau where the infantry, however, was defending from basaltic walled blockhouses resistant to the heaviest fires from the Soviet-made artillery. And out of the last several years of fighting in Vietnam there are episodes wherein infantry in strength, well preset as to ground and weapons, and heavy with tank-killing weapons, failed to fire and fled at the approach of enemy armor.

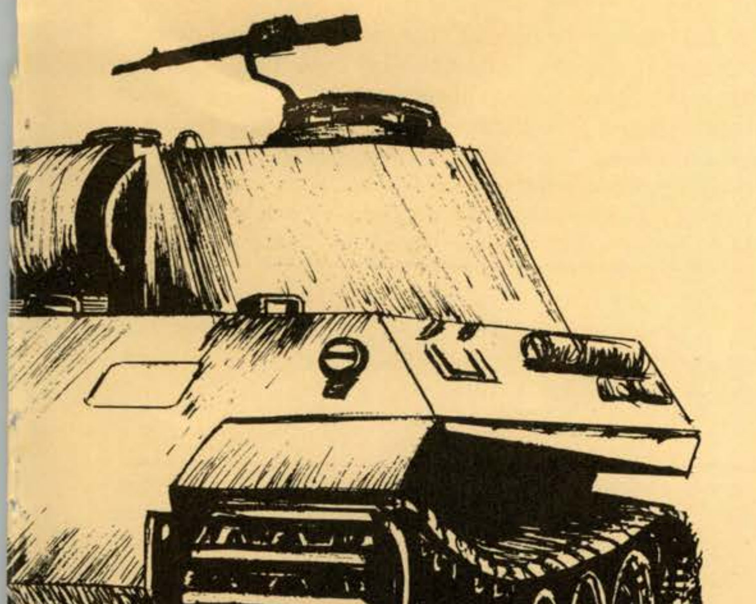
Putting it all together, the point is that if there were sedulous cross-checking of the tactical circumstances in the largest possible variety of cases, it might be learned that there are certain principles governing what can be done and what had best not be attempted. The point in inquiry emphasized here is what an American infantry line is likely to do under the threat of being overrun by armor.

That question raised, these two propositions are put forward tentatively as to what may be concluded:

Infantry in the open and defending against armor on a fairly broad front, however weaponed, has relatively little tank stopping power in the moral sense unless supported by fire from artillery and by armor which is getting visible and partially decisive killing results.

On the other hand, when enemy armor is moving into a defile, or advancing under any such conditions that the defenders can hit from the flank, centering fire on single targets without manifest danger of being taken in flank while so doing, well-trained infantry will accept the risk and will move aggressively to beat down the attack.

The same moral advantage applies to the defense of a built-up area where infantry can fire from behind protecting walls and rubble piles. It is equally true of defense amid hedgerows and sunken roads or in any terrain where armor is restricted to the road. Under that heading come causeways and river passages where there is flank cover along the defending shoreline, and approaches over low ground in hill country. Forested areas and other barriers naturally impassable by tanks also provide moral stiffening to the infantry defense.



In sum, the requisite condition is this—that in the mind of the infantryman using the weapon on the ground it must seem reasonably apparent that at hand there is effective cover, that he has an advantaged position over the enemy armor, whether that position puts him on the flank of his target or prevents the armor from directly sighting on him. Then he will likely fight his weapon whether it be a recoilless rifle, bazooka, wire-guided missile, or even a tank-killing grenade.

But expecting the infantrymen to stand firm and die hard simply because he has a superior weapon in his hand that can kill tanks at heretofore undreamed ranges is no good. Men are not made that way and training will not make them over. The knowledge that the hardware he carries has an unprecedented potential for working massive destruction over a great distance will not steel his arm nor lift his spirit one degree if he is nakedly in the open. The reality that boggles his mind is that the oncoming enemy tanks out there can snuff out his life in the next several seconds. At whatever range fire is opened and however weaponed, the infantryman cannot bear the brunt of a head-on assault by armor with any prospect of success.

That there are conspicuous individual exceptions, though a cause for pride, proves no rule. An occasional American, cast in a more heroic mold than his fellows, will stand resolutely against anything, whatever the odds. Not a few of them finish the run as Medal of Honor cases posthumously. One such who deserved that award but did not get it was Lieutenant Don Levy of the 82nd Airborne Division, who seeing what was confronting him and knowing what he was doing, advanced against a battalion of German infantry and three tanks at the La Fiere crossing of the Merderet River in Normandy in June 1944 and took them on singlehandedly with Gammon grenades and a light machinegun. He routed them, survived and was killed a few days after that. His kind rarely live very long and there are not enough of them that weapons and tactical calculations can be based upon them.

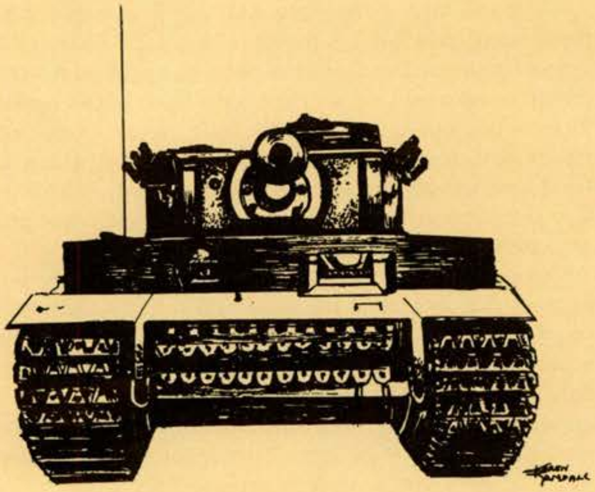
All of this may sound elementary but it brands as illusory the notion that infantry in defense is *ipso facto* assured stability and firmness of unified response if equipped with weapons certain to penetrate the toughest hide which comes against it. That is important, but not the main thing. More decisive results flow chiefly from a more intelligent use of ground, and from keeping infantry sure of foot and mind, so that it will almost instinctively go to the most useful ground and protective cover in a developing situation.

There may be a seemingly small paradox here. For once it happens that in combat the infantryman has some small success with his weapon, his desire to use it will rise practically apace with his confidence, even under circumstances that are little inviting and may grow increasingly forbidding. But again, we are dealing with raw human nature. For it is still more certain that if he knew his weapon could not fire, or would malfunction, or once he came to believe that it was being far over-touted by the Army, he would become of little or no value in any stress situation. The basic fact is, that not only how he feels but what he does and all of the surrounding circumstances bear upon his spirit and so influence his ability to take any action for better or worse, that how things seem to be may become far more important than the hard reality.

An infantryman afoot and alone, though bearing the finest sure-kill antitank weapons that the mind can devise, is still not the equivalent of an artilleryman behind his gun. The difference lies in the moral values. The very solidity of the gun gives him something substantial to tie to; the fact that he can reach out and touch other members of the crew provides a sense of togetherness; together, these factors compose his mind and compel him to action. The point need not be labored; any man who under fire has sought the protection of a wall, a rail fence, a haystack, or a pine stump, will understand what I am talking about. Even strong men are not devoid of a certain degree of "ostrichism" on a fire-swept field. Again, it is not how things are but how they seem that makes the difference. The forlorn Japanese soldier who on Kwajalein Island tried to counter an attack by an American flamethrower by opening up with a hand fire extinguisher had much the same motivations as the rest of us. Being behind a 2-inch sapling in the face of 88-mm fire provides a modicum of peace of mind unlike being behind nothing at all, as ridiculous as that may seem.

As a speculation, on a battlefield of movement, or as the attack force starts to close, the odds will work out this way: The greater the range over which the missile gunner first tries to engage the target, the less likely it becomes that he will eliminate the tank from action unless he gets in a disabling shot with the first or second round. The closing of the distance, which should be to his advantage, is more than offset by the spectacle of the onrush of the armor, the mounting confusion, the rise of the dust storm, the impact of an initial failure, and the generally expanding violence, all frazzle the nerve of the gunner. This is to point out that the quantum jump in possible killing range raises as many questions as it provides answers. While the Yom Kippur War is something of a mixed bag, its battlefield developments do not indicate that the greatly extended effective range of the AT missile is greatly to the advantage of the defense, but to the contrary.

So it might be more illuminating to reexamine some of the older and better authenticated data if we are to come to a few



hard-boiled conclusions about whither experience is pointing. From World War II in Europe, there are a few spectacular episodes in the man against armor category; possibly each of them throws a revealing, if narrow light on the subject of human reaction in this supremely testing circumstance of the battlefield. For obvious reasons, the frantic but numerous episodes in which the lone individual charges a single tank and tries to disable it with his hand-carried weapon, however futile the gesture (in one instance by swinging a saber), are discounted and disregarded, the motivations being unknown and unknowable. Pertinent to the inquiry only is an organized defense involving a group of individuals, who are aware of the odds against them and still accept them, to either to succeed or fail. The question is whether infantrymen can be conditioned to so stand and if they will individually keep their wits and do the best thing.

It is well known that in the Christmas morning (1944) battle at Bastogne, Belgium, 18 German medium tanks came on and over the line of the 327th Glider Regiment holding an arc of the perimeter to west of the town. Also, it is known that the overrun infantry kept its integrity and continued to fight, and in the end, the enemy armor was destroyed.

Little more than that of the story has been told in print, the official history treating it quite briefly. Still, it is sufficient to suggest that these were men of uncommonly tough fiber, full of fight, fast on their feet, and reliant on one another. Indeed these qualities were salient in them. The brunt of the armored blow was borne by Company A, 401st Glider Infantry, an attached battalion of the 327th. The battalion was commanded by Lieutenant Colonel Ray C. Allen, a remarkably gutty East Texas cowman.

The best measure of the fighting elan of the battalion is that on the morning of the attack its men in line were covering their ground with five .50 caliber machineguns and two light machineguns in excess of the two light machineguns allowed by the tables. They had scrounged this extra weapon power and were quite happy to carry the trebled load. This was a general characteristic of the 101st Airborne Division; its people never overlooked any chance to build up weapon power. They would preempt friendly armor, if they could get their hands on it, and then experiment until they knew how to operate it.

There were 77 men in the Company under First Lieutenant Howard G. Bowles in the hour of the action. They were spread over a sector approximately 1,100-meters wide, organized generally along a low ridge line, with a large pine plantation on the company's right and a smaller wood patch in the company's center where the company CP was placed. Two tank destroyers (TDs) of the 705th Tank Destroyer Battalion were in position in a forest patch directly behind the CP about 200 meters away, and two other TDs were in tree cover farther up the hill about 400 meters to the left. Company A's machineguns were disposed with interlocking bands of fire so as to tie together the general front defended by the glidermen and the destroyer crews. Under fire, the two groups had earlier learned how to work together and the bond of mutual confidence was strong.

"I gave no orders. There were no orders to give. . . . The chance for the position to hold depends on each group doing the right thing."

Reconnaissance had already convinced the Division G3, Colonel H. W. O. Kinnard, that this sector was the most likely avenue in the whole defensive circle for a thrust by enemy armor. Bowles' men had been so told. Additionally, late on Christmas Eve, Company A began to hear the clank of enemy armor out beyond its horizon. The noise came from the forward elements of 15th Panzer Grenadier Division, which was just entering upon the battle for Bastogne.

At 2200 on Christmas Eve, following a direction from Kinnard's office, Lieutenant Jack Adams, commanding the Third Platoon, was given 10 picked men by Bowles and told to work out through the fog and dynamite the culvert short of the village of Flamizoulle whence the sounds of enemy tank activity were coming. The patrol was gone 5 hours. The fog had helped Adams to make his approach safely. But it had also slowed his movement. He got to the culvert, drilled a few holes, and put in the dynamite sticks. Then he heard the tramp of German infantry marching along the fill and coming toward him. He felt that he had to withdraw, though he had not completed his mission.

He so reported to Bowles and at the same time told him, "there is plenty of German armor moving around in that village." Bowles at once asked for an artillery shoot on Flamizoulle and got it but in very limited numbers due to the acute shell shortage. (The guns were limited to five rounds per day.) It was too late anyway to be effective. Almost coincidentally, Private Allie Moore came on a run to the CP from the Second Platoon's outpost to tell Bowles that a large force of Germany infantry and "many, many tanks" were moving directly against his front.

Bowles legged it toward the outpost, getting there just in time to see the armor come on. It was in column and moving on a line which would take its point directly between Second Platoon forming his left flank and the Company CP. Bowles then sprinted back to his own position.

From that moment on, though the column of armor was advancing so slowly that it took at least 30 minutes to move through Company A's ground (Bowles had first sighted it at about 600-700 meters out), the response of the defenders to

their situation was almost wholly automatic.

Bowles said it this way: "I gave no orders. There were no orders to give. One doesn't give orders just to let people know he is still about. To give practical directions in detail under such conditions is impossible; therefore, to attempt to do it is a blunder. The chance for the position to hold depends upon each group doing the right thing."

The closing to first contact by the German lead elements on Company A's forward position must have taken place roughly between 0340 and 0420. (No one was keeping a log in that interval.) But it was not a direct front against front go. The enemy force was having its trouble with the fog and it came on at an oblique, undulantly. The targets as first seen by Company A's men were strung out anywhere from 25 to 400 meters to their front.

For Sergeant Tom MacLaughlin, holding down a .50 cal machinegun on the left flank, doing the "right thing" (as Bowles put it) was to fire and continue firing into the enemy column. For Second Platoon, which was looking right down the muzzle of the enemy thrust, the "right thing" was to fold down right-flank-ward to the much better cover on the somewhat higher ground held by Third Platoon. They did this as a body, no order being given, and no one bolted. For the Company CP group in the little wood, which was no less directly under the enemy gun, the "right thing" was to continue to fight with whatever they had, and it wasn't very much. Under Lieutenant Ralph J. Nelson, they met the enemy armor with the fire of *M-1s* and carbines. It was in this group that most of the night's casualties occurred—four dead and five wounded. Though only about 200 meters behind them, the pair of tank destroyers nearest them remained silent. Due to masking by the intervening trees, they couldn't see the point of the enemy armor until it rolled right past them. The German tanks had been whitewashed and the few infantrymen moving alongside the armor were clad in white sheets which made them as intangible as apparitions.

From their reaction,. the enemy would have been quite justified in concluding that they had come upon a weak outpost hardly worth a passing shot.

One German tank commander, seeing the destroyers, mistook them for part of his force, and cursed them aloud for dallying. No one answered. No one fired. And so he continued on.

Thus far, it should appear clear that the reaction of the American defenders during the armored passthrough was far short of headlong engagement. There was little fire. The decisive elements in the line, seemingly in possession of their own faculties, either did nothing, or moved to the ground which seemed to afford the greatest opportunity. Nothing resembling a mutual recoil had taken place. The Germans were probing. The Americans, not consciously waiting, paused out of uncertainty.

From their reaction, the enemy would have been quite justified in concluding that they had come upon weak outpost elements hardly worth a passing shot. And that is exactly what they did conclude. When interrogated the following morning as prisoners, following their defeat, that was what they said.

As the last German tank cleared through Bowles' position, somewhere between 15 and 20 minutes after the first exchange of fire, the defense came fully to life as if by a prearranged signal. The two tank destroyers behind the CP whipped over and joined the pair that had been covering the left flank. In salvo they fired rearward on the enemy column now fully vulnerable, for at last they were taking the German armor in rear. They then moved out and fired again and again. Five of the enemy *Mark IVs* were totally destroyed at this stage of the action. Thus reduced, the column reeled and fell apart. Its forces separating, some were smashed by the fire of supporting artillery. Others veered north and were finished off by the bazooka fire of Company C, 502nd Parachute Infantry, which had also fallen back to tree cover in face of the attack.

In its breakthrough, the German armor had routed the Battalion Commander, Colonel Allen, out of his CP. But Allen had not been taken wholly by surprise. There came a telephone call from Captain Preston E. Towns, commanding Company C, "Tanks are coming toward you." Asked Allen, "Where?" Said Towns, "If you look out your window now, you'll be looking right down the muzzle of an 88."

"Tanks are coming toward you. . . . If you look out your window now, you'll be looking right down the muzzle of an 88."

Doubting, Allen went to look. Sure enough. He hit the floor and crawled to the telephone to call Colonel Joseph H. Harper, the Regimental Commander, to say that the tanks were right on him. (The time was about 0600 give or take 15 minutes.)

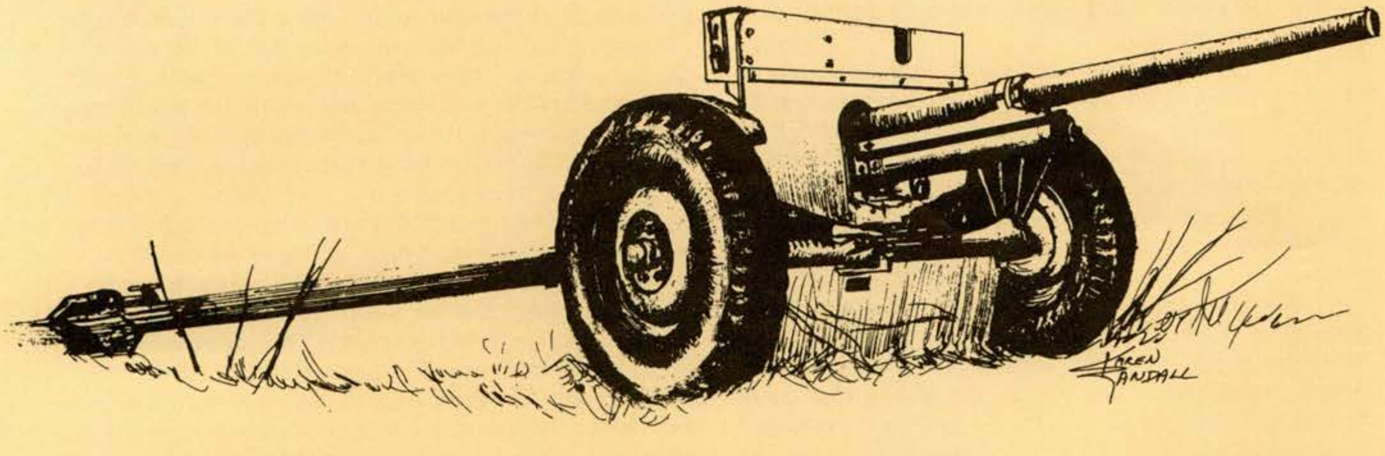
"How close?" asked Harper in his habitual laconic manner.

"Right here," said Allen."They are firing at me point blank from 150 yards. My units are still in position, I think. But I've got to run."

Then he sprinted from the house as fast as he could go, with one German tank gunner taking pot shots at him as he dashed for the woods. First light was just coming, but he could see the muzzle blasts over his shoulder in the semidarkness. But each round was leading him. The German was giving him credit for more speed than his legs possessed.

Two members of Allen's staff had followed him out. As the three came out at the far end of the woods, riflemen of the 502nd Infantry who were posted along the ridge road saw them and promptly pinned them down with volume *M-1* and carbine fire. The three then crawled back into the woods, circled south through a shallow swale, and returned to the CP at Hemroulle. As they came out of the woods for the second time, they were fired on with rifles by men of the 463rd Parachute Field Artillery Battalion who had formed a skirmish line in case the enemy broke through the infantry. By then Colonel Allen was getting tired of friendly fire and he waved his handkerchief vigorously until finally the gunners lowered their rifles and let his party come in.

To complete his account, a second look must be taken at Second Platoon. Having quit its ground and gone to the wood with Third Platoon when it saw the enemy armor bearing down, it moved back as a body to its assigned ground after the last German tank passed through. The move was voluntary, without the necessity of an order being passed down the line.



That was determined by prolonged interrogation of the group; it is eloquent testimony that the word "demoralization" does not apply to any part of its action. Not a man had strayed off during the movement back and forth.

Second Platoon was thus in the correct position to knock off the enemy infantry assault line that, following along behind the tanks, had mistaken the meaning of their easy passage. Bowles' one mortar (the other had been overrun by the armor) found this body immediately and punished it hard while the Germans were still bunched. Fire from the machineguns caught them from left and right. The screams of the wounded rose high above the other noises of the fight. Checked before they could bring any effective fire to bear against Company A's line, the few survivors of this anticlimatic action came in with their hands up.

As with the machineguns, the company's bazookas were in extra supply thanks to scrounging, but they played no effective part in the fight. Those bazookamen out of Second Platoon, after they joined Third Platoon in the wood, couldn't shoot because of interdiction by the trees. Thereafter, the German armor came on at such a rate and angle that getting on its flank was impossible.

Therefore, in final analysis the fight is conspicuously one in which a body of foot fighters, heavily disadvantaged as to numbers and weapons, survived and succeeded by staying light on their feet. It was a victory won more through tactics than because of fire power; and the pattern came as such of the loser's blunderings as of the winner's maneuvers.

When the tactics are analyzed in detail it will be noted that, with the individual as with the group, they are the tactics of survival and not those of desperation. There is no frantic, overpowering urge to engage frontally despite the onrush of the threat. There is no cry of alarm. And the controlled calm holds from bottom to top. The sergeant, Tom MacLaughlin, fired his .50 cal machinegun but he also got away from his post before he could be run down. Colonel Allen and his staff ran all out when that became the main chance of seeing the fight to its finish, but they are hardly more in motion than they begin to maneuver.

So we will turn the page to the story of a daylight fight between barefisted infantrymen and enemy armor that was staged under even more harrowing conditions. On the first day of the Normandy invasion the Germans struck back with tanks against the effort of the 82nd Airborne Division to seize and hold the causeway crossing the Merderet River at La Fiere. The objective of the Division to begin with was to gain control of a vital corps bridgehead. Throughout the first day that aim became frustrated due to the blundering of various tactical elements within the Division. Once, twice, three times these units had the far shore of the bridgehead under control, then marched away from it voluntarily, not realizing they were abandoning a prize.

The climax of the fight to hold a grip on the nigh shore came somewhat late in the afternoon. The Merderet at this point and time was not much of a military obstacle, the stream being only 8-feet wide and less than 1-foot deep, though the trench was about 2 feet below the level of the banks.

There may have been bloodier small fire fights in the modern history of the Army than the one staged on that slightly marshy ground, though I am at a loss to name any. Company A, 505th Parachute Infantry, was holding the east end of the causeway during the showdown. The company had had unique good fortune during the night drop and had marched to its mission in practically full strength, a success unmatched elsewhere among the American airborne. Of the 147 men who could stand to be counted on that first morning, only 81 remained by afternoon of the second day, which number included 22 who were walking wounded. When First Sergeant Robert M. Matteson, a dour character whose countenance would have qualified him to play the top kick in "What Price Glory," lined up his survivors to march them away from this grim scene on the second afternoon, he remarked to them, "If people don't think men get killed in war, they ought to take a look at this company."

For at least one reason, the statistics of the action are worth remembering: they belie the oft-repeated assertion that no unit can lose more than 20 percent of its strength and still fight.

On the first morning, Company A was terribly blooded

during its advance across the last two hedgerow-bordered fields in trying to get to the Merderet Bridge at the eastern tip of the causeway. I have the play-by-play account of this engagement in the book, "Night Drop," which is the essence of the official record. Pondering its dreadful details, one wonders what kind of men these were that they could keep going after the first hour. Because that part of the fight is not pertinent to the issue discussed here, it is omitted.

By noontime, the enemy garrison covering the east end of the causeway was liquidated and the fight for the bridgehead was seemingly won. Company A then dug in directly east of the bridge (hardly more than a culvert) thereby blocking the road against any enemy force that might come on from around Amfreville, the one fair-sized town directly west of the river. So placed in hasty foxholes, the Company was looking right down the mouth of the armored attack that came over the causeway in midafternoon. This embankment, tree-bordered and about 20 feet in width, ran through the marsh for about 500 yards. Enemy flooding had turned the low ground into a lake. Any German strike from the west would have to approach via the narrow causeway.

As a first warning, the position began to receive fairly intense mortar fire from the direction of Amfreville. On order from the company commander, a party of four men then moved out to set up a secondary roadblock just to the west of the bridge. The group was composed of two bazookamen, Private First Class John D. Bolderson and his assistant, Private Gordon C. Pryne; and a machinegunner, Private First Class Lenold Peterson, and his assistant, Private Marcus Hein, Jr. They carried forward and emplaced in the roadway one mine apiece, and they they dragged a ruined truck onto the bridge and put it behind the mines to further strengthen the block.

Only recently abandoned by the Germans, there were some neat, very deep foxholes about 2 rods beyond the minefield on the left-hand side of the embankment. The four men slipped into these positions, paired together, with about 25 meters separating the forward post from its support. This put them about 25 to 50 meters from the front of the company.

Next he put four rockets on the tank's turret with no apparent effect—except that the tank's cannon swung around on him . . . .

Out of the tempest of supporting mortar and machinegun fire the German column came on in late afternoon—two medium tanks followed by approximately a battalion of infantry. The point got almost to the roadblock. Then, the tank commander suddenly stood in the lead turret. A machinegunner, Private Clarence Becker, fired from the left flank of the company line and killed him. Simultaneously, the two bazookamen forward cracked down on the lead tank, their fire mingling with that of a 57-mm AT gun firing from a hill behind the company.

Slowed in getting into the action by the intervening thick foliage of the poplars, the forward bazookaman, Bolderson, got off only one round before the lead tank, its commander dead, stopped and began firing its cannon. The first round snapped a concrete telephone pole that, rising directly above Peterson, barely missed crushing him when it fell.

Three more rockets apiece were fired into the lead tank by the two bazooka men before it went ablaze. There had been no explosion. So far as the bazooka men are concerned, that is the end of the action, though their superiors mistakenly credited them with playing the decisive roles and each was awarded the DSC.

Peterson, the machinegunner, working his own weapon to the limit, had been exhorting the bazooka men, in broken English and Swedish curses, to fire on the second tank. But for Bolderson and Pryne that meant jumping out of the foxholes and going forward on a run into the open. Also, the enemy column appeared to be stalled. And so they remained immobile.

Then, Peterson saw the second tank swing out wide to the left as if trying to come around the blazing wreck. That signalled that his own outpost line had had enough, and would quickly be overrun if he dallied, so he grabbed Bolderson's bazooka and remaining rockets and ran forward about 20 yards to clear the trees that were screening the tank.

Next he put four rockets on the tank's turret with no apparent effect—except that the tank's cannon swung around on him, and he played African Dodger for 3 to 4 minutes to keep from getting potshotted, then ran to the tank's opposite flank. A fifth round from the bazooka hit fair where the turret joins the body. There was still no effect. His next round hit the track. Again he ran forward a few yards to get on the tank's rear. The next rocket hit fair and right where he wanted it: he had fired at a range of about 15 feet. Still, the tank started backing away, lumbering badly on account of the fouled track. Before it could move more than a few feet Peterson got away his last rocket. That round exploded the tank and the crew was incinerated in the ruin.

All that saved Peterson's life during those moments was that fire from the company position which had driven the German infantry back to cover. From their foxholes on the western embankment some few of the defenders had a fairly clear view of the one-man show: their fire was enough to achieve that measure of restraint. So not a few of the defenders helped in turning the Germans back from the Merderet that afternoon, though the beating down of the direct thrust pivoted on the unbelievably mad performance of one man.

I remember him as a quiet person somewhat on the awkward side, age approaching 30, of medium height, underweight rather than robust. His English was badly broken and his speech halting. He seemed about as aggressive as the Swede janitor in Elmer Rice's "Street Scene." Certainly no casting director would have placed him in a warrior part. For his day's work, which was only half begun, he too was awarded the DSC, which relatively speaking was an insult.

There ensued for Company A's main line a terrible evening, night, and morning. Its people were under fire of such intensity that strength dwindled hour after hour, and Sergeant Matteson, directing his wounded rearward found himself feeling "like a traffic cop."

Peterson, Bolderson, and the other pair had returned to their foxholes on the causeway bank where the enemy fire could barely scathe them but do no more. During the night, other fractions of the Division had come up and taken ground on both flanks of the company along the embankment. But the men were not told they were there and continued to believe that there was no support anywhere around.

In midmorning of the second day the Germans tried again with armor, four Renault tanks leading, followed by several

companies of infantry. Peterson and the other three were still in their isolated foxholes forward. But this time Peterson had a bazooka in his hands from the beginning. The group fired until the armor came abreast. The stunted poplars got in their way. And German infantry crawling along the embankment kept their pits under a grazing fire which made free action impossible.

So Peterson yelled an order and the four of them ran back to the company line. There they resumed fire with the bazookas. Between their fire and that of the 57-mm gun, which was now placed right on the embankment, the first Renault was stopped as it tried to turn around the two ruined medium tanks. So the German counterattack was again brought in check, though this time there was a marked change in the situation. The German infantry now had a broad wall of steel from behind which they could pour fire into the American rifle pits. They made swift use of it. At 40-45 meters range the two sides became locked in a death embrace, one hugging earth, the other metal.

Peterson had temporarily spent himself in this last bout with the armor. Again lugging the machinegun, he found an empty foxhole, fitted in, and was shortly asleep.

Lieutenant John J. Dolan, the company commander, was about 100 yards upstream from the embankment next to the bridge, the point of white heat. There the full pressure was falling on what was left of the platoon under Lieutenant William A. Oakley, whose men hardly dared raise their heads. The mortar barraging from the west bank had become unbearable. Casualties were occurring all along the line. Oakley was hard hit by one burst and spouted so much blood that he had to be dragged away from the fight over his protest. His place was taken by Sergeant William D. Owens, a slender, sallow, quiet little man, so retiring as to looks and disposition that on those primary grounds he would seem disqualified for a command role. It was a measure of his reticence that during the fight he did not once raise his voice to troops before Oakley was evacuated.

The position was falling apart. Owens could feel it. There was not longer any yelling along the line. The friendly fire was tapering off, fast. Quite a few stragglers from other airborne units had fitted into the line during the night; most of them had started crawling away rearward when the Renaults appeared. Under the bombardment from the German mortars, the few remaining strays started running away. Among them was a strange lieutenant, who popping up from nowhere, yelled, "We can't stop them; it's time to get out!" Had it sounded like a command, he might had collapsed the position. Half of Oakley's men were dead or wounded by that time. Of Owens' squad, there remained only three men.

Owens arose. Then he started walking around, talking to the remaining men and telling them that they must stick it. He was conspicously in the open, not more than 35 yards from the bridge and double that from the German fire base behind the wrecked tanks. That he escaped death during the next half hour can be counted a small miracle. By the account of everyone present it was his steadiness—and that alone—which held the position. Once he got started, he was at no time fazed and he seemed to walk absolutely without fear, which stiffened the backs of some of the other men for at least a time.

The time came when some of Owens' men told him they couldn't continue the fight; the position had become untenable. Owens was still up and walking about in the open. By then, however, the machinegun ammunition supply was down to one box per gun, and the guns were so overheated that when the gunners paused, the guns continued spitting. Owens heard several of his fighters growl, "We gotta get the hell out of here," but still nobody moved out, the strays having earlier departed. One of the bazookamen said to him, "Sergeant, if we don't move now, we'll all be killed." Owens answered loud enough for the others to hear, "No, we will have to wait for orders; we haven't been told that we can go." But, still, he was uncertain of his decision. So he sent a runner over to Dolan's foxhole to ask what he wanted done. Back to what remained of the platoon came the message, and Dolan had written it out, "I don't know a better place than this to die."

Half of the company were already casualties and Owens' force holding the bridge was down to 15 men.

There followed 3 to 4 minutes of crisis while the survivors argued about the message.

Then suddenly it was all over.

The Germans raised a Red Cross flag under which a small party came forward to request a 30-minute ceasefire in which they could remove their dead and wounded. But when the respite was over, they didn't charge back; that battalion had had enough. The fight to win the Merderet crossing was to continue for another 2 days, but toward that end, Company Ahad given its full measure.

With Dolan present, the survivors all told me, "It was Owens who saved the position; he was the one who rallied us; the rest of us were through." But Dolan, though less than 100 meters from the platoon during the fight, still had no perspective on the decisive moral influence of his subordinate. He put Owens in for the Bronze Star, and incredible as it seems, that was all that Owens got.

The two cases described in this narrative are examples toward proving that in the archives there are resources available from which much more might be learned about fighter behavior in the hand contest with armor, provided they are collated and analyzed. Probably in the end we would come up with nothing more startling than this: That what numbers of men will do in a fight will depend on what one or two men of their company put forth in the moments of greatest trial, and that wisdom as to the use of ground means more than any amount of confidence in the power of a weapon. If that were all, it could still be important toward superinducing greater soundness and correct emphasis in combat training.

SAMUEL LYMAN ATWOOD MARSHALL (Brigadier General, U.S. Army Reserve) was a noted military historian and civilian journalist. He served in France in World War I, and worked as newspaper columnist until 1942, when he reentered the Army. He established the Army News Service, and helped organize the Army's Historical Section. As a combat historian in the Pacific, and later chief historian in the European Theater of Operations, he developed and used the interview technique for conducting battlefield historical research. After the war, he returned to civilian life, returning to the Army to cover the Berlin Airlift, Korea and Vietnam. In addition to the many books he authored, he contributed dozens of technical reports and professional studies to military journals and civilian magazines. He died in 1977.

Trainee Stress

by Major Joyce A. Burchard
and Captain James M. Georgoulakis

". . .the initiation of the recruit into the military [is] a traumatic experience, not unlike that of a cultural shock."

The basic training period in the Army is generally accepted to be a time of considerable physical and emotional stress. The basic training environment is usually completely alien to anything an individual has experienced before. Bourne[1] stated that entering the Army is probably the most acutely shocking event that individuals have every experienced. It represents the most destructive threat to their adaptive capacity that they have ever had to endure. From the start, the stunned, frightened behavior in this situation bears a striking resemblance to that seen in physical disaster situations such as bombing raids, fires, or earthquakes. Coates and Pellegrin[2] have referred to the initiation of the recruit into the military as a traumatic experience, not unlike that of a cultural shock.

From the start, demands are made of him in which he is not sure how to meet. He is involved in a situation 24 hours a day without any opportunity to modify the environment. Datel and Lifrak[3] suggested that the stress of basic training is considerably greater than the stress of living experienced by psychiatric patients. Additionally studies by Clum, Plag, and Kole[4] involving Marine recruits confirm the levels of distress experienced by trainees.

However, in spite of these findings, the goal of reducing stress in basic training has traditionally been questioned. The argument frequently stated is that "the stress of recruit training will help ensure effectiveness and survival in combat and other assignments. Although the transfer of learning in this situation is questionable, the crux of the matter seems to be the appropriate level of degree of stress that would be conducive to good performance and adjustment."[5] In view of these findings, an investigation was undertaken at Fort Knox, Kentucky to determine the stress levels of basic combat trainees.

The sample studied consisted of 150 basic trainees who underwent basic combat training (BCT) at Fort Knox, Kentucky from 1 October 1978 to 1 January 1979.

Group one, the day-care group, consisted of 50 basic trainees who were experiencing difficulties and were referred by members of their cadre to the Community Mental Health Activity (CMHA) for evaluation. These individuals were evaluated as manifesting signs of social and emotional maladjustment to the extent that they received a medical profile restricting them from further participation in basic training and were recommended for separation from the military by the counselors at CMHA. Subsequently, these trainees were separated from the service. Prior to their separation, these individuals remained at the CMHA during duty hours and received intensive individual and group therapy.

Group two, the fourth-week group, consisted of 50 basic combat trainees who were in their fourth week of training. According to their drill sergeants and commanders, all were completing all tasks required of them and were not experiencing any adjustment difficulties.

Group three, the twelfth-week group, consisted of 50 trainees who had completed basic training and were in Advanced Armor Training (AIT) According to their drill sergeants and commanders, all were completing all tasks required of them and were not experiencing any adjustment difficulties.

The instrument utilized for measuring levels of anxiety was the State-Trait[6] Anxiety Inventory (STAI). It consists of separate self-report scales for measuring two distinct anxiety concepts: the state of anxiety and the trait of anxiety.

The trainees in the day-care program were adminstered the instrument on the first day they were admitted to the program. The trainees in the other groups were administered the instrument on their first day in their fourth and twelfth week of training, respectively.

Once the data was obtained, it was analyzed through the use of "F" and "T" tests as well as Hartley's Fuax procedure.[7] The raw data for the groups is contained in tables 1-3.

The data were then analyzed around the following questions:

- Do the three military samples differ in their "within group" variability in terms of state and trait scores?
- Do the military samples differ in their mean state and trait scores?
- Is there a difference between the state and trait scores of the day-care program when compared with patients admitted to the Veterans' Administration Hospitals[8] for anxiety reac-

Table 1. Age and Educational Level.

	Day-care	4th Week	12th Week
Sample Size	50	50	50
Age			
Mean	19.75	19.44	19.76
Mode	18.00	19.00	18.00
Median	19.00	19.00	19.00
Ed. Level			
Mean	11.0	11.3	11.5
Mode	12.0	12.0	12.0
Median	12.0	12.0	12.0

Table 2. State Anxiety Scores.

	Day-care	4th Week	12th Week
Group Size	50	50	50
Range of Scores	25-79	21-78	25-75
Mode	73	45	32
Median	67	43	33
Mean	63.6	45.8	42.6
Standard Diviation	11.77	12.74	10.83

Table 3. Trait Anxiety Scores.

	Day-care	4th Week	12th Week
Group Size	50	50	50
Range of Scores	24-80	22-73	23-60
Mode	55	36	37
Median	56	42	39
Mean	53.36	43.48	40.68
Standard Deviation	12.02	11.70	9.04

tions or depressive reactions?

Utilizing the .05 level of significance, the findings were as follows:

- The military samples in both the state and trait scores do not differ in their "within group" variability.
- The military samples differ in means of state and trait scores, therefore they cannot be considered random samples from a single population.
- Within the military samples, the day-care group had higher state and trait scores than the other groups. The other groups, (4th and 12th week of training), did not differ.
- The day-care group trait scores were equal to these of the depressive reaction group.
- The day-care group state scores were higher than the state scores of the depressive reaction group.
- The day-care group trait scores were higher than those of the anxiety reaction group.
- The day-care group state scores were higher than those of the anxiety reaction group.

From the results of this investigation, a number of findings merit consideration. First, it appears that the scores of the individuals who are in CMHA's day-care treatment program differ greatly in terms of state and trait anxiety scores than those from the general population studied. In fact, at the time of admission to the day-care program, their state and trait scores were more closely associated with hospitalized neuropsychiatric patients of the anxiety and depressive reaction type than those of the basic combat trainees.

Secondly, although basic combat training may be stressful, it is felt that those individuals in the day-care program possess an extremely high trait for anxiety combined with a low tolerance level for stress. Consequently, the added stress of BCT becomes the precipitating event which overloads the individual's ability to successfully cope. Thus, they respond in a manner which resembles that of an anxiety or depressive reaction, and necessitates their being removed from training.

Thirdly, the stress of BCT appears to remain constant from the fourth through the twelfth week of training. Additionally, those trainees who resemble anxiety reactions or depressive reactions in terms of state and trait scores will surface in the first 2 weeks of basic training.

In summary, this investigation reveals a number of interesting postulates involving basic combat training. However, before any firm conclusions can be drawn about stress in basic combat training with an all-volunteer force, additional investigations are necessary.

REFERENCES

[1]Bourne, P.G., "Some observations on the Psychological Phenomenon Seen in Basic Training." *Psychiatry: Journal for the Study of Interpersonal Processes,* 1967, 30 (2), 187-196.

[2]Coates, C. H. and Pellegrin, R.J., *Military Sociology: A Study of American Military Institutions and Military Life.* University Park, Mo: Social Science Press, 1965.

[3]Datel, W.E. and Lifrak, S.T., "Expectations, Affect Change, and Military Performance in the Army Recruit," *Psychological Reports,* 1969, 24 (3), 870-878.

[4]George A. Clum, John Plag and Delbert Kole, "Changes in Self-Reported Symptomatology During Recruit Training," Reprinted from the *Proceedings,* 76th Annual Convention, APA 1968. Defense Documentation Center.

[5]Anderson, Betty S., *Adjustment to Recruit Training,* National Technical Information Service, U.S. Department of Commerce, December 1974, p. 26.

[6]Spielberger, Charles D., Gorsuch, Richard L., and Lushene, Robert E., *STAI Manual,* Consulting Psychologists Press, Inc., 1970.

[7]Ericksen, Gerald L., *Scientific Inquiry in the Behavioral Sciences,* Scott, Foresman and Company, Glenview, Illinois 1967, p. 207.

[8]Shielberger, Opt. Cit, p. 8.

MAJOR JOYCE A. BURCHARD joined the Army Nurse Corps in 1966 after 10 years work as a civilian RN. She received her R.N. from Memorial Hospital, Cumberland, Md. A graduate of the Army Medical career course, she has a batchelor of science degree in Nursing from the Medical College of Georgia and has just completed work on a master's degree in Public Service from Western Kentucky University. She is currently serving as a Psychiatric Nurse Practioner at Fort Knox, Ky.

CAPTAIN JAMES M. GEORGOULAKIS was commissioned in the Medical Services Branch with a BS from the University of Alabama in 1971. He also holds masters and educational specialist degrees from several universities. He served as the assistant chief of the Community Health Activity at Fort Knox at the time this article was written. Since then he has completed the Advanced Medical Officer course and is enroute to an assignment at Fort Riley, Kan.

Recognition Quiz

This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

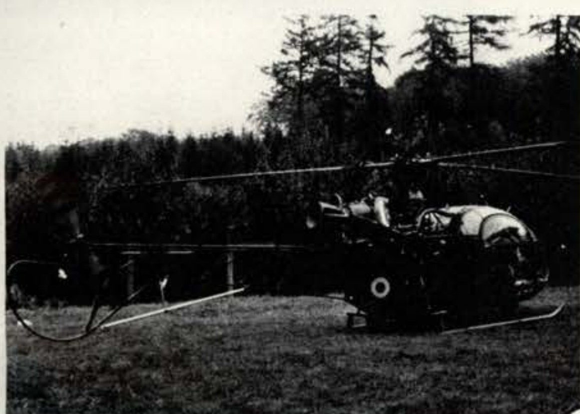
(Answers appear on page 60)

1

2

3

4



5

6

NEW BRAZILIAN ARMOR

by Richard M. Ogorkiewicz

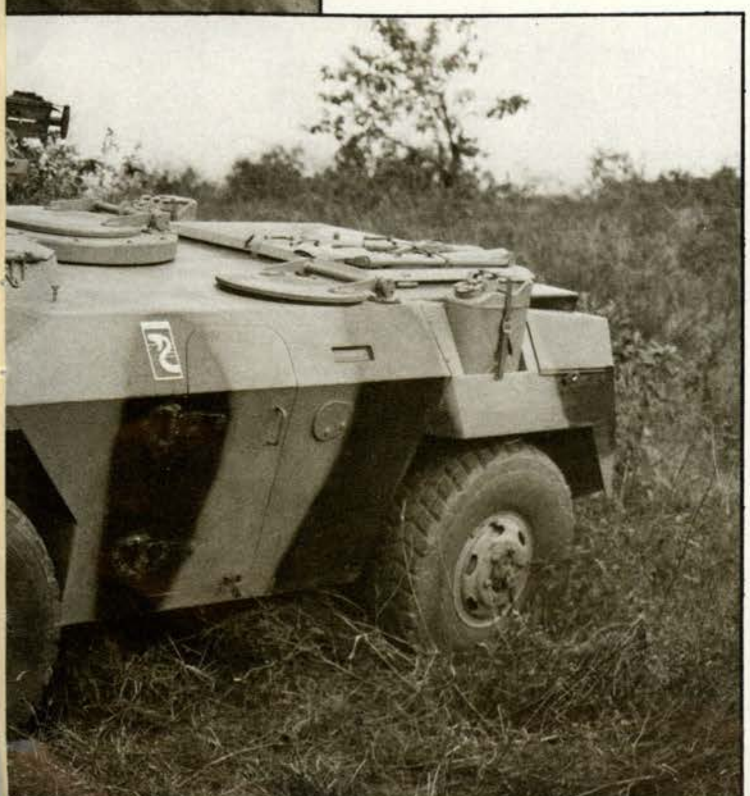
Brazil is still a relative newcomer to the development and production of armored vehicles. However, in the past 7 years it has made remarkable progress in this field. In fact, Brazil has become the Western World's largest manufacturer of wheeled armored vehicles.

The remarkably rapid progress made by Brazil in armor is due to the wheeled armored vehicles designed and built by the Engesa Company of Sao Paulo--which, in the automotive sense, is the Brazilian equivalent of Detroit. The two most important vehicles developed by Engesa so far are the *EE-9 Cascavel* armored car and the *EE-11 Urutu* armored personnel carrier. Both have been mentioned already by the writer in the March-April 1973 and the May-June 1977 issues of ***ARMOR.*** However, both vehicles have been developed further and they have also been used as the basis of several new models. Moreover, Engesa has extended its range by developing two entirely new vehicles, the *EE-17 Sucuri* tank destroyer and the *EE-3 Jararaca* scout car.

Cascavel Armored Car

The development of the *Cascavel* armored car has reached the stage where the fourth successive model has already been built in prototype form. The current production model is the *Cascavel III,* which is an advance on the *Cascavel II* and even more on the original *Cascavel I* built in 1972-73.

The most important new features of the *Cascavel III* are its



turret and main armament. Thus, in contrast to the *Cascavel II* which was fitted with a turret and 90-mm gun made in France, *Cascavel III's* turret and gun are made by Engesa.

Like its French predecessor, the new Engesa gun is of the low-pressure, smooth-bore type and has a caliber of 90-mm. However, it fires fin-stabilized HEAT projectiles, with a higher muzzle velocity of 2,950 feet per second, which give greater accuracy or longer effective range. Moreover, in addition to HEAT and HE rounds, it is also provided with HEP or HESH rounds, for engaging a variety of targets.

The 90-mm Engesa gun was actually designed in Belgium but its prototype was already made in Brazil. It is of simple, robust design which should minimize the amount of maintenance it requires. At the same time its tube, breechblock and the high-efficiency triple-baffle muzzle brake are made of the latest, high strength, ESR steel, which helps to keep it relatively light.

The new turret resembles the two-man turret of the *Cascavel II* but, like the hull, it is welded from Engesa's dual hardness armor. This armor is made from two different steels which are rolled into plates with a hard outer layer and a softer but tougher inner layer that give optimum ballistic protection.

The automotive characteristics of the *Cascavel III* are similar to those of the earlier models. In particular, it has the same double-wishbone, independent suspension for the two front wheels and Engesa's walking-beam suspension for the four rear wheels. As before, it is powered by a 174-hp Mercedes Benz diesel made in Brazil; but the engine is now coupled to an Allison automatic transmission.

The new *Cascavel IV* incorporates further automotive improvements. These include a more powerful, 212 hp Detroit Diesel engine, disc brakes, and a driver-controlled central tire inflation pressure system. The latter has already been fitted to some *Cascavel IIIs* and considerably increases their ability to cross difficult, soft patches of ground.

The turret of the *Cascavel IV* has also been improved to incorporate a commander's cupola with an externally-mounted machinegun fired by remote control and the commander has been provided with a passive day/night sight. There is also provision for mounting a laser rangefinder and a number of *Cascavel IIIs* have in fact already been fitted with one.

All this makes the *Cascavels* even more effective as light, multipurposes armored vehicles. In particular, their combination of an effective main armament with a high degree of mobility qualifies them for reconnaissance, counterrecon-

naissance, security, fire support, and antitank roles. It is not surprising, therefore, that the *Cascavels* have been widely adopted. In fact, they have been procured not only by the Brazilian Army but also by other armies in Latin America, Africa, and the Middle East.

Urutu Armored Carrier

Effective as they can be, armored units equipped with the 90-mm gun *Cascavel* are even more effective when they are provided with a complementary armored personnel carrier. This vehicle is the *Urutu,* which has been developed simultaneously with the *Cascavel.* The two vehicles have the same engine, suspension, and performance which greatly simplifies the operation of units equipped with them, including maintenance and logistics.

The *Urutu* differs, however, in one respect from the *Cascavel,* namely in being amphibious. In fact, it is not only capable of floating in water but is also fitted with four air intake and exhaust pipes which can be elevated above the level of the hull roof so that even if waves wash over the vehicle there is no danger of it being swamped. In addition, the *Urutu* is fitted with two propellers and rudders. As a result of all this, it can not only swim across inland waters, but can negotiate surf, which makes it suitable for amphibious landing operations from the open sea and which has led to its procurement by the Marines of the Brazilian Navy as well as the Brazilian and several other armies.

In its basic configuration, the *Urutu* can carry up to 12 men, including the driver, and its main armament is a .50 cal machinegun on a shielded mount above the commander's hatch. In addition, there are 11 firing ports for the riflemen and experimental versions have been fitted with several different turrets. These include a one-man turret with a 20-mm cannon and an open-top turret with a 60-mm Hotchkiss-Brandt gun-mortar.

The development of the armored personnel carrier has now been followed by several derivative vehicles. One of them is a workshop vehicle which is essentially the same as the basic armored carrier but which is fitted with the equipment required for carrying out maintenance or repair work on other vehicles.

Another vehicle derived from the *Urutu* is an armored ambulance. This has an additional armored superstructure to increase headroom in the crew compartment which can accomodate four stretcher cases or six to eight seated cases. The vehicle is also fitted with a refrigerator for medical supplies and an air-conditioning system as well as oxygen breathing apparatus.

The *Urutu* has also been used as the basis of an antiaircraft vehicle. This consists of the basic armored carrier and a twin 20-mm gun *TA 20* system developed in France by Electronique Marcel Dassault (EMD), which incorporates a low altitude surveillance and target acquisition radar. The combination of the *TA 20* system with the *Urutu* chassis forms a highly mobile antiaircraft system which is capable of accompanying light armored units and defending them against attack by low-flying aircraft and helicopters.

Sucuri Tank Destroyer

Having developed the *Cascavel* and the *Urutu,* Engesa next designed and built the prototype of a heavier and more powerful vehicle, the *EE-17 Sucuri* tank destroyer. This is also a six-wheeler but it weighs 40,000 lb, compared with the 26,000 lb of the *Cascavel.* Moreover, it is armed with a medium-velocity, 105-mm rifled gun, which makes it as powerfully armed as any wheeled armored vehicle built so far.

The 105-mm gun of the *Sucuri* is of French origin and fires

the same HEAT projectiles as the gun of the French *AMX 30* battle tank, albeit with a somewhat lower muzzle velocity. The gun is mounted in an oscillating turret which is also of French origin and which was first developed for a special version of the *AMX 13* tracked tank destroyer built in France for the Netherlands Army. The turret incorporates an automatic loading system which contains 12 ready rounds, with five more rounds stowed in the turret and 20 in the hull.

The turret is occupied by the commander and gunner. In addition to the driver, the hull accomodates a radio operator. This provides the *Sucuri* with a crew of four, which helps it operate over long distances. Its actual range on roads is 375 miles and its 300-hp diesel engine gives it a maximum road speed of more than 50 mph. Therefore, the *Sucuri* possesses considerable operational mobility which, given an adequate road network or suitable terrain, enables it to reach engagement positions more quickly than any similarly armed tracked vehicle.

In addition to serving as the basis of a tank destroyer, the chassis of the *Sucuri* is also suitable for several other purposes, such as that of a self-propelled carriage for field artillery, antiaircraft systems or tactical missiles. At present, however, the development of the *Sucuri* is still confined to the tank destroyer prototype.

Jararaca Scout Car

The latest armored vehicle to be developed in Brazil is at the other end of the weight scale from the *Sucuri.* This is the *EE-3 Jararaca* scout car which, in contrast to the *Sucuri,* is considerably lighter than the *Cascavel* or the *Urutu.*

The *Jararaca* has been designed to meet a world-wide demand for a vehicle to bridge the gap between the various 1/4-ton and 1/2-ton trucks and armored cars or light tracked armored vehicles. The former are mobile and relatively inexpensive but, because they have no armor protection, they are highly vulnerable to the smallest weapons. The latter are armored but they are much more expensive and more powerful than is necessary for many roles. There is a need, therefore, for an intermediate vehicle, that is a light, low-cost armored vehicle—which is what the *Jararaca* is designed to be.

In order to keep its cost to a minimum, the *Jararaca* is based on the maximum use of standard components. In particular, it has the same axles and suspension as the Engesa *EE-15* 1½-ton, 4x4 truck and is powered by a commercial 116-hp Mercedes Benz diesel. Its hull is of simple, integral construction but it is welded from the same dual-hardness steel armor as the *Cascavel, Urutu,* and *Sucuri.*

The hull of the *Jararaca* is large enough to accomodate three men, including the driver. In its basic, prototype form it is only fitted with an open ring mount for a .50 caliber machinegun, with which it weighs 9,000 lb. However, it is suitable for the installation of several other weapons, including a 20-mm cannon, a 106-mm recoilless gun, or an antitank guided missile launcher, such as the *Milan* which is produced jointly by France and Germany for their own and several other armies.

In consequence, the *Jararaca* can be adapted to a wide variety of roles. These range from reconnaissance and antitank missions to liaison, command and communication, internal security and policing. This wide variety of possible roles, coupled with its inherently low cost, should open for the Jararaca a wide field of application and strenghten still further the position of Brazil as a leading producer of wheeled armored vehicles.

RICHARD M. OGORKIEWICZ, widely recognized as a leading authority on armored fighting vehicles, is a consulting engineer and author of two books and more than 200 articles, including 68 in ***ARMOR,*** on various aspects of armor. He has also lectured extensively on the subject not only in the United States and England, but also in Sweden, Israel, Brazil, and South America.

Training—One Way

by Lieutenant Colonel Robert R. Hardiman

You're not a tanker or an engineer or . . . ! You're a United States Army officer who has a specialty in armor (or engineering or . . .). Your mission—the mission of *all* of us is to train. And if you and your contemporaries are poor trainers, then I as a field grade commander have failed in my primary mission: to train you, the company grade officers. That's what I get paid for.

What do I mean by training? Everything, including maintenance. As Lieutenant General Arthur S. Collins said, "Training is all-encompassing and should be related to everything a unit does or can have happen to it."[1]

Recognize that training is the most difficult mission we have. It is the most difficult because measures of training can and must be basically subjective. It is easy, very easy to unwittingly fool oneself with regard to the true status of training. And actual training itself is, therefore, one of the easiest things to "fake"; and "fake it" many do and will continue to do if you and I let them.

To have actual training, apply the basics of training management set forth in TC 21-5-7. I did. What I learned and relearned is listed below.

Soldiers want responsibility, want to be challenged, want to be told how well they measure up to their challenges.

The battalion commander must personally be *involved* in training on a continuing basis.

Well trained individual soldiers make well trained units.

Noncommissioned officers train individual soldiers.

Noncommissioned officers must be held responsible and accountable.

Unit schools for noncommissioned officers must not be established.

The learning center, TEC system, Soldiers' Manuals, SQTs and ARTEPs must be integrated into the training program.

A battalion training guidance letter (TGL) must be developed.

TC 21-5-7, *Training Management in the Battalion* must be read by all officers to include company commanders and platoon leaders.

There is always time to train, but soldiers must learn to recognize the opportunity and to seize it immediately.

Emphasis must be on not who was/is trained but on who was/is *not* trained.

Battalion commanders must communicate with company commanders about training.

All training must be immediately evaluated.

Regardless of what is said or done, no unit can have or will have a viable training program unless the battalion commander is personally involved in it. Training cannot and will not thrive at the hands of junior officers until or unless senior commanders create a healthy environment for training[2] and that is best done by their personal involvement. That involvement must include formulation as well as visits and inspec-

tions.

To create such an environment, one cannot blindly follow TC 21-5-7. For those who do so overlook one of the most important tenets of that circular, that is, the absolute necessity for battalion commander and company commander communication about training. To realize this, my staff instituted a weekly training management session between the battalion commander and each company commander. The sessions were to be 30 minutes each. Attendees in addition to the two commanders were the S3, unit first sergeant and training sergeant.

The battalion commander's task in this session was to *remain at ease until* he had been briefed by the unit commander on unit accomplishments (including maintenance) of the preceding week, activities of the current week, plans for the next week and hopes for 2 weeks hence. The first sergeant briefed on individual training during the same periods and the training sergeant on specific activities such as physical training testing, schools, levies, etc. At the conclusion of this briefing, objectives guidance, deficiencies, and challenges were discussed and resolved. These sessions not only ensured that both commanders were in mutual agreement with regard to the training to be conducted, but the young unit commander and his staff had had an opportunity to have their "say."

An all-important component of the training sessions was the battalion training guidance letter or TGL. The purpose of the TGL was to answer those oft-repeated questions of "What do I do? When?" How easy it is for the senior commander or his staff to respond, "Train your unit!" However, with the ever-increasing administrative burden placed on our unit commanders, that answer is not only unfair, but unjust. It denies the unit commander of the value to be gained from the experience and the knowledge of the senior commander and his staff.

To resolve that problem, the TGL was created. The TGL was published on a quarterly basis. It specified what the officer and noncommissioned officer required readings were, how battalion evaluations were to be conducted, what the battalion had scheduled during the quarter, and also prescribed, by MOS, soldiers' manual tasks to be trained in weekly. The soldiers' manual tasks were those that battalion required be done as well as those that each company required done.

The mechanics of preparation of TGL were essential to its success. A draft TGL containing all but the company prescribed tasks was prepared by the S3 and battalion commander. That draft was then given to each company commander and to the staff for comment and for addition by, MOS and by week, of those tasks that the company commanders wanted accomplished. The draft TGL with the tasks and comments was reviewed by the battalion commander and S3. Where resolution in favor of a unit commander was not possible, that unit commander was provided an explanation personally by the battalion commander. The TGL was then published and adhered to.

The mode of publication of the TGL merits discussion here. To simplify both the preparation of as well as the actual training schedule itself, the battalion published two schedules: a schedule of calls (routine) and a training schedule. Both were designed to be displayed with the TGL, but the schedule of calls was republished only as needed while the training schedule was published weekly. The weekly training schedule, however, was reduced to only that training being presented that week; it did not duplicate the schedule of calls in any way. The training schedule also did not reproduce the TGL's list of tasks by MOS by week; these were reflected as "Individual Training." Additionally, the training schedule listed in the notes the topics of the command information classes and the planned services by company. Planned services were those that the company hoped to complete if all went according to plan; in the training session, the training sergeant was required to note services not completed with explanation provided by the unit commander. Those unaccomplished were then rescheduled for the next week.

Essential to the concept of the TGL, as it was to all training, was the evaluative process. But an evaluative process requires evaluators and evaluatees. Initially, neither existed in the unit. Early on in his command, the battalion commander determined that today's soldiers were reticent only about volunteering, not performing. Soldiers actually wanted to be told *what* to do and *what with* and then be left to attempt to do the task given. In this manner, responsibility was sought, not avoided. Those unable to do the given task also sought to gain the skills, but were easily frustrated. To remedy this situation, enhanced individual proficiency was the obvious solution. The means to attain that solution was the noncommissioned officer in his traditional roles: proficient in, and accountable and responsible for, individual training.

The problem was how to get the noncommissioned officer to resume those traditional roles. Each one emphatically noted that he had never, himself, been properly trained in his skills and duties. Unit schools (greater than 2 hours per week) as well as Army schools as solutions to this problem were considered and rejected because of the large numbers of personnel involved and because of the time such would require. Convinced that the best way to learn to lead is to be one of those led, the battalion commander did two things. First, he issued this order: "The battalion will be run by the noncommissioned officers"—and made it stick, and 3 weeks after he assumed command, he issued a two-part mission. Part I went to the noncommissioned officers: "You are to be prepared to take a hands-on test on *all* the tasks in FM 7-11 B1/2 NLT 1 Feb 78. Exclude those tasks peculiar only to the infantry. *All* will take regardless of MOS."

Part II went to the S3: "The evaluation or NCO stakes is to be basically hands-on (27 of the 28 tasks were eventually hands-on): it is to be so 'tough' that those successfully meeting the battalion standard of 80 percent for qualification and 60 percent for validation will be recognized by all as clearly outstanding."

Although met with initial skepticism, the mission was accomplished. It caught the attention of both battalion and non-battalion noncommissioned officers. The latter were concerned that they might have to take such a gruelling test. The evaluation and the commander's insistence that the battalion actually be run by the noncommissioned officers reestablished the noncommissioned officers as accountable, responsible, and proficient. The results of this individual-type evaluation were so outstanding that comparable evaluations were made an integral part of the training program.

The lesson gained from the NCO evaluation was not lost. It was a prime dictate of the battalion commander that *all* training be evaluated when and as it was undergone. The method of evaluation was up to the trainer, but hands-on testing was preferred. The TGL specified Thursday afternoon as the time of battalion evaluations of weekly training. Individual service

members and squads were selected at random. Testees were given minimal advance notice to preclude "quick studies." The hands-on testing was administered by the S3. The testing was of the capabilities that the testees should have had, had the testees received the training prescribed in the TGL and training schedule for that week.

Results were immediately provided to each testee with unit results (by name) furnished to unit first sergeants and to training sergeants at Friday's operations meeting. Unit results (by number only) by MOS were briefed to the battalion commander by the S3. Appropriate commendations were made by the battalion commander at battalion formations with explanations and corrective actions provided orally by units at weekly training sessions.

But, it must be emphasized and reemphasized that capabilities were tested, not hours spent testing! Company commanders, having previously concurred in the TGL and the training schedule, were free to schedule training or not as long as they ensured all personnel had the requisite capabilities by Thursday afternoon. Unit noncommissioned officers were encouraged to determine the necessity for training of their personnel by administering the TEC lesson pre-test for any particular task. Thus, there were no fixed periods of instruction to which a higher level inspector could go to determine the appropriateness of the training being given. At the lowest level, the mission given was, "Have your personnel trained in this task NLT Thursday." The mission was, "Train!"

This system addressed specifically the *what* and the *when* for each task without getting into the *how*. To resolve the other related question of the *what with*, for the individual noncommissioned officer and soldier, the battalion used the vast resources of the battalion learning center (LC) and installation education center. Having established a battalion learning center with civilian staff, the problem was to convince personnel of its great value. That was done by expanding the availability of LC materials and TEC machines through a vigorous expansion program. TEC machines were placed not only in the LC, but also in dayrooms, supply rooms and motor pools.

Additional materials were borrowed or made available to the companies. The S3 reduced competition for limited LC materials by astute scheduling. Among the mandatory materials for officers and NCOs (E5 and above) were TEC tapes on how to use the machines and "TEC for Green Tabbers" and "Sergeant's Business." This approach significantly raised the awareness of the potential of the LC.

But for the officers, the program was still lacking. These young leaders were being required to function in a system they

knew little about. To remedy this problem, a series of required readings for officers only was specified in the TGL. After an appropriate time, formal evaluations were conducted to ensure comprehension and completion of the required readings. As U.S. Army officers, the majority of the readings were applicable Army-wide to the operations of combat units. Especially included for company commanders and their officers was TC 21-5-7; this was purposely done to dispel the myth that only officers serving at battalion or higher should be aware of the doctrine for training management at battalion levels. This was a difficult program to implement, but one well worth the efforts when considered in terms of officer proficiency as well as job satisfaction.

The concept of the job satisfaction has always eluded implementation in the U.S. Army. Simplistically considered, an organization whose task is to be able to close with and destroy the enemy has difficulty finding an enemy to be destroyed in peacetime. An acceptable substitute must be such a challenge to the soldier that he is forced to keep his skills at a level in peace that will allow him to excel in war. That well-trained soldier will make a well-trained unit.

To address that challenge, two traditional excuses for failing to train had to be eliminated: no time; and training records. The former is in itself a problem that can be resolved by training and education of senior commanders and staffs. At the level at which training occurs, the training to be accomplished is a mission. The "*how*" of accomplishment of that mission is up to the individual to whom it is given. That "*how*" must by definition include the "*where*" and the "*when*"—wherever and whenever possible in the limit of the constraints of the mission given.

This approach, forcefully implemented, requires the responsible individual to organize and to use fully every available minute. By providing examples (not directives) of how peers, for example, have used the 5 or 10 minutes previously spent waiting for equipment to conduct training, soldiers can learn to recognize training opportunities. There is always time to train. The time may have to be "stolen" from other activities, but we must learn to recognize the opportunity and to seize it immediately when presented.

The latter excuse can be quickly remedied by considering the real purpose of training records. That purpose, really, is to tell us who has *not* been trained. With the actual purpose in mind, training records can be reduced to those who did not attend or who by virtue of receiving a "NO GO" on the evaluation of the training given were considered as not attending. Add to these a chronological list of arrivals since the date of the class and those who were *not* trained are identified.

Admittedly, this approach, particularly when used by subject area and not by individual name, eliminates much of the traditional training inspections of higher headquarters. But, it also now makes it possible to address the challenge of motivating the soldier to attain and retain a high level of individual proficiency.

To attain and to maintain individual military proficiency was the task. All leaders have floundered on this "rock." The answer lies in personal pride and in motivation of that pride. There are few among us who would not admit that our soldiers relish a challenge. Almost without exception, when challenged they rise to the occasion in spite of the most adverse conditions. And once that challenge is met, they subside until the next is poised. The problem then in conceiving a series of challenges at such intervals that an acceptable level of proficiency is maintained. And that is what was done.

A program of quarterly "perks" to hone unit and individual proficiency was adopted. These "perks" also abetted the establishment of meaningful goals for the unit. Convinced that the value of on-duty unit schools (all-day classes) for unit noncommissioned officers was marginal at best, the battalion commander adopted a "perk" system of "show me." The system was designed as a series of quarterly evaluations of individuals, noncommissioned officers, squads or sub-units. These evaluations were designed primarily as a series of hands-on tasks with standards and composition for individual evaluations comparable to that of the NCO stakes previously described above. And they were "tough."

The intent was to have an event each quarter in which the individual soldier could demonstrate to *all* peers, subordinates,and superiors his individual proficiency. Key to this program was formal recognition of outstanding performance with battalion certificates at battalion formations. As implemented, the program alternated between individual evaluations and off-post ARTEPs, annual general inspections, joint training exercises, and SQTs.

Of prime importance was the announcement, the conduct of the evaluation, and the timing of each perk. To obtain the desired motivation, the evaluations had to be the battalion commander's and his alone, which the soldiers had to clearly understand. The soldiers, on the other hand, insisted that the conduct of the evaluations be constantly supervised by the battalion commander for fairness.

Too great an interval between perks makes the system only marginally effective; whereas, too short an interval "burns the soldiers out." Trial and error revealed that the best system was individual evaluations alternating with unit/ARTEP exercises every other quarter. The success of the "perk" system is measured in the repeated demonstrated abilities of the individual soldiers on their ARTEPs, SQTs, field exercises and in the confident manner in which they continue to maintain their own and the proficiency of each other.

This is the way one battalion trained. It found that for training to be effective, there had to be a goal and the more external and specific that goal—the better the training was. We told our soldiers what was expected, gave them the "*what with*" and then *demanded* that they rise to the standards set. To ensure success, we continuously and openly evaluated progress, commending whenever possible, and counseling wherever necessary.

We did it. So can you, . . . if you want to!

LTC ROBERT R. HARDIMAN was commissioned in Engineers from the USMA in 1961. He has served with combat engineer units, a Special Forces group and has had staff experience at battalion, brigade and Office of the Joint Chiefs of Staff levels. He is currently attending the Naval War College, Newport, Rhode Island.

PROFESSIONAL THOUGHTS

Smaller Crews

The purpose of reducing the number of crewmen in tanks is twofold. First, it would increase the number of tanks on the battlefield; and, second, it would reduce the size of the individual tank target.

Efforts to reduce the number of crewmen in a tank from the current four have generated many disadvantages, both real and imaginary. Supposedly, the most serious problems have arisen from the inability of less than four crewmen to operate the system, the need for four or more men to service and maintain the vehicle, and the belief that four persons are required for continuous operation.

Discussing these objectives in reverse sequence, it can be said that four crewmen are not required for continuous operation. Continuous operation can be broken down into two phases, active combat and rest. During the active combat phase, the entire crew is committed to fighting the vehicle, whether that be one crewman or a dozen. During the rest phase, one of three states of alert is usually maintained; i.e., 100 percent, 50 percent, or minimum. A 100-percent alert is similar to active combat in that no one is resting. A 50-percent alert is the usual condition on an unengaged portion of the battle area. It calls for half the crew to be alert and half to be resting. No advantage is gained in terms of rest with a large crew.

When minimum alert/maximum rest is called for, the current posture is to have one man awake in each vehicle. With a crew of two or three, having one man awake in each vehicle would be excessive. Under the same conditions, the infantry does not have one man awake in each foxhole. It has one man guarding his fire team or squad. Likewise, having one man awake in every other vehicle or in each section ready to give the alarm provides adequate security and maximum rest.

With currently fielded tanks, reducing the crew below four would be a maintenance disaster. However, a properly designed vehicle (i.e., one designed specifically for reliability and ease of maintenance) could be maintained by two crewmen. In fact, a reduced maintenance load per vehicle is a basic assumption to crew reduction.

Basically seven functions need to be divided among the crew members: driving, gunnery, vehicle command, loading, target acquisition, vehicle defense (dual target engagement) and, in some tanks, unit (or tactical) command. These tasks are divided as follows:

Driving—driver
Loading—loader
Gunnery—gunner or commander
Target acquisition—commander/crew
Vehicle defense—commander
Vehicle command—commander
Tactical command—commander

In the future, the division of tasks could be rearranged to facilitate crew reduction; for example, a vehicle organized to accommodate a crew of two for standard vehicles and three for command vehicles. The following assignment of tasks could be made:

Driving—driver
Loading—mechanical loader
Gunnery—commander (driver alternate when stationary)
Target acquisition—commander
Vehicle defense—none
Vehicle command—commander
Tactical command—third crew/tatical commander on designated vehicles

This comparison brings out the one weakness of the two- or three-man crew—the vehicle is usually unable to engage two targets simultaneously. Just how a tank is designed for a crew of two or three and what it will look like are questions raised at this point.

Externally, the tank will look much like a small modern battle tank. The hull will contain two crew stations and the turret one. The first station in the hull is for the driver, who is outfitted with full driving controls, auxiliary gun controls that are similar to the current tank commander's override, and remote sights. The sight could be a television link to the regular sights, a separate coupled hull-mounted sight, or a combination of the two. The second hull station is the auxiliary station. It is a duplicate of the driver's position and on command tanks is used by the vehicle commander/gunner. From this position, the vehicle commander/gunner fights the commander's tank. The third crew station is in the turret, which is equipped with full gun controls and sights. From this area, the vehicle commander fights the standard tank; in a command tank, the tactical commander controls his unit.

A tank with a crew of only two or three could be a possibility if certain requirements are met. The first requirement is for a reliable system requiring half the maintenance manhours of the current family of tanks. The second need is for a positive automatic loader with the ruggedness and reliability of a human, but requiring less space. Third, reliable remote controls that will permit several functions to be controlled from a single crew station would be necessary. All these requirements are well within the state-of-the-art of current technology.

What benefits in the overall tank force can be derived from reducing crew size? The vehicle size and signature could be reduced because less volume would be needed, and reduced volume means less armor and a lighter weight. The lighter weight would permit a smaller engine and therefore, a totally smaller vehicle. But that possibility is only a by-product. The real benefit derived from smaller crews is the increased numbers of tanks available to the Army. Currently, the total number of tanks is limited not so much by the cost of the tanks themselves, but by the combined costs of procurement and operation. Over the 20-year life cycle of a tank, crew costs make up the dominant percentage of expense. Additionally,

Figure 1. Alternative Extra Crewmen

	Crew	Alternative	Total	No. Bn	Tks. Div
Base battalion	4	1 per 4 or 1 per tk	5	6	324
Alternative A	2/3	1 per tank	3/4	9	486
Alternative B	2/3	1 per 4	2/3+	10	555
Alternative C	2/3	1 per 2 man tk	3	10	540

Figure 2. Alternative Organizations

	No. Bn	Organization Co x Plt X Tks	Tks. Bn	Tks.Div	Excess Crewmen
Base battalion	6	3 x 3 x 5	54	324	0
Alternative A	6	3 x 5 x 5	84	504	108
Alternative B	6	5 x 3 x 5	88	528	36
Alternative C	6	4 x 4 x 5(-1)	90	540	0

the size of the total force is limited by the ability of the Army to recruit soldiers. Reducing crew size alleviates much of both of these problems. The extent to which crew reduction can increase the tank force can be seen in the following example.

A type-armored division has 6 tank battalions of 54 tanks, organized as 3 companies of 3 platoons of 5 tanks, a total of 324 tanks. If we assume 5 crewmen for each tank (The fifth tank crewman test has been completed, and at press time, the final report had not been released), we have a pool of 1,620 tankers. If we hold that pool constant and use it to man tanks requiring a crew of two on all standard tanks and a crew of three in command tanks (platoon leader vehicles, the two tanks at company headquarters, and the three tanks at battalion headquarters), we can produce a significantly stronger force.

In battalions organized with 54 tanks and with 1 additional crewman per tank (in crews of 3 or 4), the division could field 486 tanks in 9 battalions. Assuming 1 extra crewman for each 4 crewmen required (this is the current ratio proposed), the division could field 555 tanks in 10 battalions. Providing 3 crewmen per tank would allow the division to have 540 tanks in 10 battalions (figure 1).

All of those numbers assume no battalion overhead, which is ridiculous. Therefore, let's try some new organizations to go with our new tanks. We should hold the number of tank battalions in a division constant at 6, not exceed our tank crew pool of 1,620, and provide each tank with 3 crewmen as parameters for our force structure. We can produce battalions of 3 companies of 5 platoons of 5 tanks, 84 tanks per battalion, or 504 tanks in the division (an excess of 108 tankers); or 5 companies of 3 platoons of 5 tanks, 88 tanks per battalion, and 528 tanks in the division (36 extra tankers); or a battalion of 4 companies of 4 platoons of 5 tanks, less 1 tank in each battalion headquarters, for 90 tanks per battalion, 540 per division and no excess tankers (figure 2). This choice represents a possible 60 percent increase in the tank force and represents a near maximum (The theoretical maximum is a 74 percent increase using the same organization but only one extra crewman for every four required crewmen) that could be reduced somewhat by the unavoidable need for extra fuel and ammunition handlers and additional maintenance personnel.

The benefits of this increase in the tank force are manifold. First, and most obvious, is the increase in the number of weapons on the battlefield. Second is the reduction in the impact of casualties on remaining strength. As an example, 20 tanks lost from a division force of 324 tanks represent a 6.1 percent loss. The same 20 tanks lost from a force of 540 tanks represent only a 3.7 percent loss. The one real weakness of the concept for a minimum crew tank is its relative inability to conduct dual engagements—one primary and one secondary—simultaneously. However, the gross increase in numbers of tanks should more than compensate for this shortcoming by allowing tanks to protect each other, much as is done by fighter aircraft.

Designing tough and reliable tanks engineered for a fighting crew of two or three will permit a substantial increase in the tank force without a similar increase in the total force cost. The small crew tank may not be on the wave of the future, but it offers sufficient benefits to make it well worth investigating.

ALFRED T. BOWEN
Captain, Armor
Ft. Leavenworth, Ks.

The Short War Syndrome

There seems to be a trend among people of tne Western World to think in terms of the short war. Whether this is due to the Judeo-Christian abhorrence of war or to man's optimistic belief that the *status quo antebellum* will be maintained with only slight interruption, the trend has very serious implications for those charged with the defense of their country.

The scenario for the future war in Europe most often heard at the various service schools during command post exercises, war games, or defense-oriented seminars suggests that NATO forces will have advanced warning of an attack due to their

satellite and electronic intelligence-gathering capabilities. This will allow the allied forces time to move from their garrison locations to defensive areas in order to accept battle under the most advantageous conditions on terrain of their own choosing.

The Warsaw Pact forces will attack using blitzkrieg tactics in hopes of quickly gaining deep objectives. As soon as the Threat forces cross into Western territory, NATO air forces will be free to cross international frontiers and attack the massed armored and mechanized forces of the enemy which will slow the momentum of their attack. The goal of Western ground forces will then be to deny the aggressors their objectives by use of the active defense and to halt the attack as close to the East-West frontier as possible.

The first battle may last 3 or 4 weeks, and it will be characterized by high intensity combat with great loss to both sides in men and material. This first phase of the war, however, will be conventional.

After the first battle, there will be a flurry of diplomatic activity due to fears throughout the world of a nuclear Armageddon. This will result in either a pullback of forces to their prewar positions or to a readjustment of the international boundaries, but hostilities will end in a negotiated settlement, *a la* Korea.

This scenario works well in a 3-day command post exercise, but real world events during the past 150 years indicate that any major conflict is going to be protracted, costly, and difficult to stop, short of total exhaustion of one side or the other. A few historic examples will illustrate this point.

The War for Southern Independence started in the Charleston habor on January 9, 1861, when a South Carolina battery manned by cadets from the Citadel fired on the merchant steamer *Star Of The West.*[1] When Fort Sumter fell to Southern gunners, four months later, President Lincoln called for 375,000 90-day volunteers. Everyone in the North thought 3 months was more than enough time to put down the "rebellion."[2] The Confederate States were equally optimistic and planned for a short war. The war, however, lasted 4 more long years, and the cost to both sides combined was 600,000 casualties.

World War I offers a more modern example of the way plans for a short war go astray.

Colonel-General Count von Schlieffen's famous plan was for a modern and massive battle of envelopment much like the ancient battle at Cannae in which Hannibal had encircled and defeated a Roman army in 216 B.C. To accomplish this the German Army's right wing, the enveloping force, was to march through Belgium with over 20 divisions. The General Staff knew that a violation of that country would bring Great Britain, a guarantor of Belgium's neutrality, into the conflict, but they thought that the maneuver would be so successful that France would be knocked out of the war before England could mobilize. Instead, the war went on for 4 more years until November 11, 1918, with casualties high on both sides. The conservative estimates are that there were 5,000 military deaths a day during the 4 years of the war with no real territorial gains for either side. Only American entry into the war and the exhaustion of the German homefront, caused by the Royal Navy's blockade, brought the diplomats to the negotiating table.

Even in World War II, which for the most part was seen as a long war from the start, there are examples of the short war syndrome. When Adolf Hitler launched "Operation Barbarossa" on June 22, 1941, he planned to defeat the Soviet Union before winter.[3] The German forces were, therefore, not issued winter equipment, and Great Britain was left undefeated as an island bastion to later be used by the allies to launch the invasion of "Fortress Europe." Four years later, on May 2, 1945, Marshal Georgi Zhukov's armies captured Berlin. These were men of the same Red Army that Hitler was going to defeat in 6 months back in the summer of 1941.

Vietnam, too fresh in most of our minds to discuss at length here, is but another example of long and hard fighting taking place while negotiations are being conducted. Thus, if we are to learn from past history, we must ask ourselves what we will do if a future European conflict becomes a protracted war.

The first problem we should address is our lack of a manpower base for mobilization. The National Guard and Reserve are 138,000 people short of their wartime requirement of 676,000 men and women. Some important steps have been taken along the lines of enlistment and reenlistment incentives, but much work needs to be done to bring these units, which are the primary backup for the regular forces, up to strength.

Secondly, the "One Army" concept must be totally understood and embraced by every regular and reserve member. Only by this approach to training and doctrine, in a spirit of total cooperation, can the goal of meeting both the wartime strength requirements and combat-proficient training standards be achieved.

Third, we must remain flexible in our thinking and not allowing our doctrine to become dogma. The armor, mechanized, and cavalry commanders who will be leading the forces on the first line of defense in Europe must fight to contain any Warsaw Pact attack in hopes that, as in the scenario, negotiations can be initiated and have a chance to succeed. But they must also be psychologically prepared to fight a long war too, if it comes to that, and to accept and use freshly mobilized Guard and Reserve units and fillers from CONUS.

Fourth, we should not thin down our logistical units so much, for the sake of "beefing up" the maneuver arms, that they cannot provide the service support needed for sustained operations.

Let us in Armor, the other branches of the Army, and our sister services plan to fight and win the first battle in hopes that it will end the war early on. But let us also plan to win the second battle, and the third, *ad infinitum,* so that victory can be achieved in any type of war that develops whether it be a short one as in the scenario or a long one in accordance with the recent history of modern warfare. Let us also keep in mind that our demonstrated willingness and our ability to fight and win under any and all conditions may deter an attack altogether. This, after all, is our primary mission, the maintenance of peace and security in the free world.

KELLY M. MORGAN
Major, Armor, USAR
3289th USAR School

---

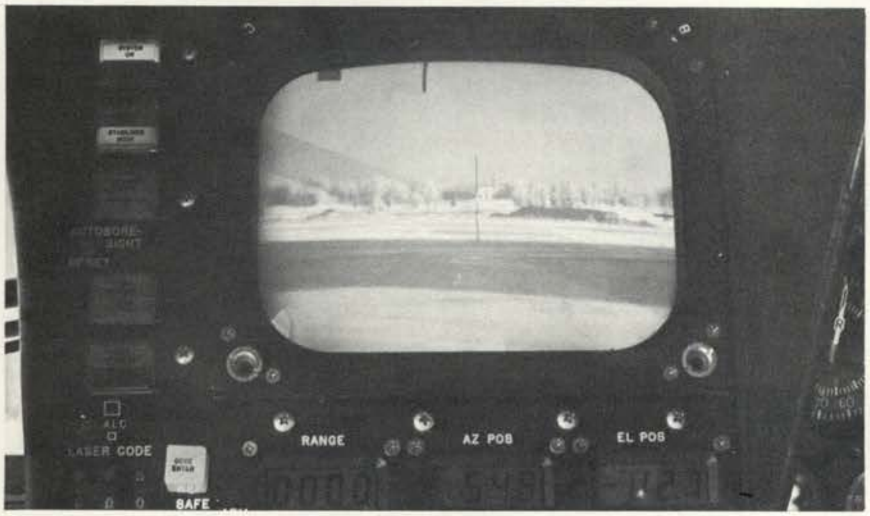
[1] Bruce Catton, *The Coming Fury.* Doubleday & Company, New York. 1961 pp 179-181.

[2] Robert G. Athearn, *The American Heritage New Illustrated History of the United States, Vol 8, The Civil War.* Dell Publishing Co., Inc., New York. 1963. p. 635.

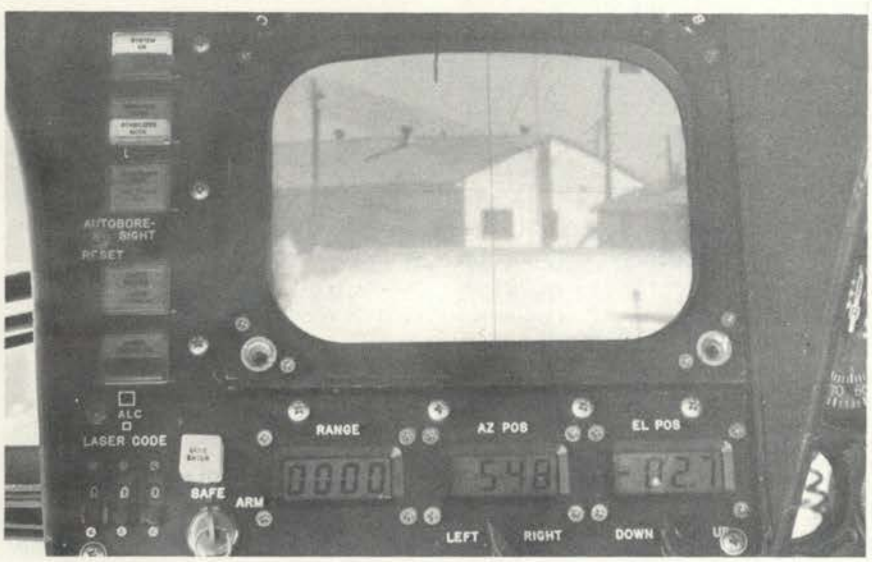
[3] Walter Goerlitz, *History of the German General Staff.* Praeger, New York. 1952 pp 387-395.

NOTES

The centerline of the sight is 24 inches above the rotor.



10-degree field



1.25-degree field

Helicopter Sight

A masttop helicopter sight capable of detecting targets at 5 km and recognizing them at 3 km was recently developed by Martin Marietta Aerospace and Hughes Helicopters.

The sight, which is suitable for use on scout helicopters, has a large field of regard, day/night laser designation capability, and minimum drag. It has been installed on a Hughes *500MD* and can be mounted on any helicopter that has a hollow shaft and an above-rotor environment that is relatively free of vibration and shock.

Production models are expected to measure 16-inches wide, 20-inches long, and weigh in at 50 pounds. The centerline of the sight extends 24 inches above the rotor. An improved version, incorporating a day/night sight, is expected to weigh 70 pounds. The viewing screen, power supply, and other equipment will raise system weight to about 105 pounds for the basic system and 138 pounds for the day/night version.

The sight uses equipment developed for other projects, including a TADS vidicon (camera), a gimballed mirror to provide a stabilized picture, an *Aquila* laser designator for *Copperhead* and *Hellfire,* and modules that are common to forward-looking infrared (FLIR) devices.

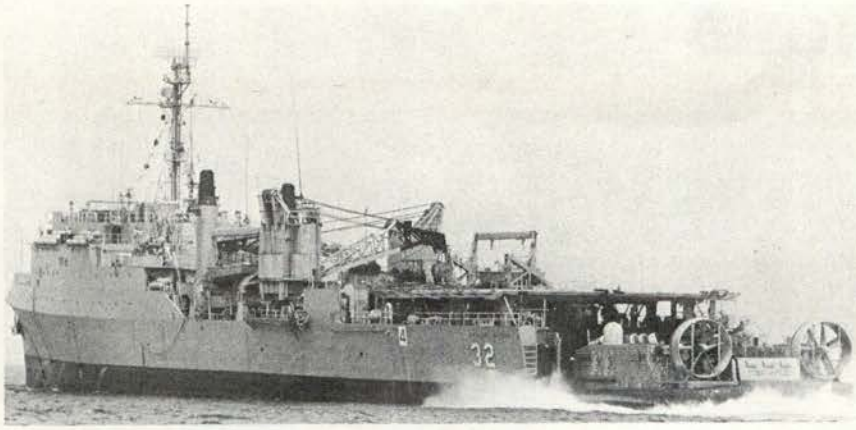
The sight can rotate 160-degrees to either side of the centerline, and can elevate or depress 15-degrees. It has two optical fields of view, 10-degrees and 2.5-degrees, and it is possible to magnify electronically a portion of each to give a 5-degree or 1.25-degree field.

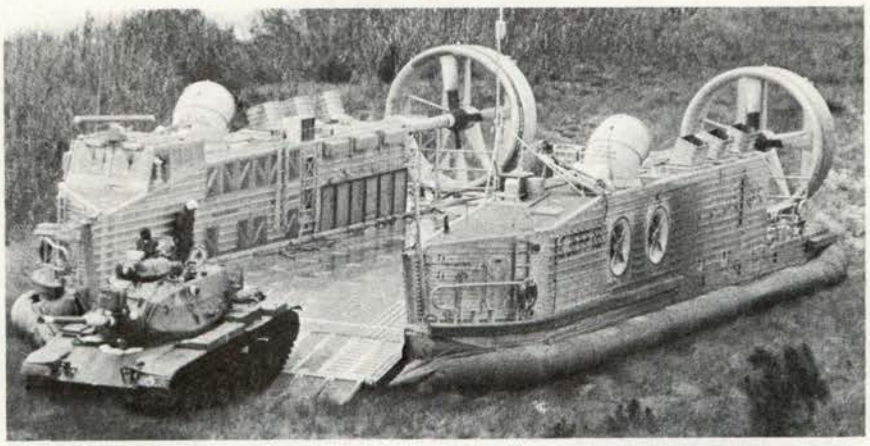
Hibbs Award Winners

This year's winners of the Joseph M. Hibbs Award are Captain Michael R. Matheny, Command and Staff Department; Sergeant First Class Jack M. Jones, 4th Training Bde; and Mr. Eugene R. Walls, Maintenance Department.

The Hibbs Award is given annually to recognize the outstanding officer, enlisted, and civilian instructors at the US Army Armor Center, Fort Knox.

Largest Air Cushion Vehicle





The new Amphibious Assault Landing Craft (AALC JEFF (B)), the U.S.'s largest military air cushion vehicle (ACV), at 160 tons, recently demonstrated the capability to carry a 60-ton main battle tank in a simulated beach assault.

The ACV has achieved an overwater speed of 62 knots (71 mph) with a full 60-ton payload, can cross surf and sand dunes as high as 10 feet, and maneuver over an unprepared beach to disembark its load inland.

In a related test, the 47-foot wide LC JEFF (B) maneuvered in and out of the 48-foot well deck of the *USS Speigel Grove* (LSD 32), which was underway at 8 knots on the Gulf of Mexico. It performed similar maneuvers with the LSD at anchor and the well deck flooded with 6 feet of water.

Later tests proved that the JEFF (B) could carry an "overload" of 70 tons, and could maintain operations with a 60-ton payload with two of its six engines shut down.

The tests were conducted by the Naval Sea Systems Command, Panama City, Fla.

New Test Equipment

Simplified Test Equipment for Internal Combustion Engines (STE/ICE) has completed its development phase and is being integrated into the Track Vehicle Mechanic Course, U.S. Army Armor Center. Distribution of the sets to USAREUR began in October 1979 and over 1,100 sets will be deployed by May 1980. The final test of STE/ICE was conducted at Fort Knox during June-August 1978 and all performance requirements and reliability expectations were met.

Each tank battalion is authorized seven of the STE/ICE sets; two in the battalion maintenance platoon, one in the headquarters company maintenance section, one in each tank company maintenance section, and one in the combat support company maintenance section. STE/ICE comes in a transit case measuring 14.25-inches high, 20-inches wide, and 16-inches deep and weighs 58 pounds. The vehicle test meter itself is only 7.4-inches high, 9.2-inches wide, and 12-inches deep. The transit case also stores the cable assemblies, transducers, and adaption hardware for hooking STE/ICE up to the vehicle.

STE/ICE is capable of measuring vacuum, dwell angles, pressure, DC volts, AC/DC amperes, AC frequency, resistance, and engine RPM. It also performs ignition timing, power, compression unbalance, starter current first peak, and battery condition tests. STE/ICE can be used on all spark- and compression-ignition engines. STE/ICE will replace the Low Voltage Circuit Tester and Tachometer/Dwell Meter Test Set. It can also be used in lieu of a multimeter and cylinder compression tester.

STE/ICE holds great promise for marked improvement in malfunction diagnosis and determination of vehicle serviceability. Modified versions of STE/ICE will be deployed to support the XM-1 and Fighting Vehicle Systems.

IFV/CFV Swim Test

The new Infantry Fighting Vehicle (IFV) and Cavalry Fighting Vehicle (CFV) (XM-2 and -3) recently underwent swim tests at Aberdeen Proving Grounds, Md.

During the tests, the fighting vehicles went 4.4 miles per hour in the water, better than 1 mile per hour faster than the M-113, according to test personnel. The vehicle's steadiness and maneuverability in water was also tested and was rated "good."

The IFV and CFV will be fitted with a nylon swim curtain, which will give the vehicle greater freeboard and reduce the chance for water to come into the vehicle, even at its combat weight of 47,000 pounds.

During the remainder of the tests at Aberdeen, which are scheduled to end in April, each vehicle is to be driven 6,000 road miles and have 12,000 rounds fired from its armament.

First M-901s to Europe

The *M-901* Improved TOW Vehicle (ITV) passed another milestone as the first seven were shipped to Europe.

This initial shipment was part of a planned 700 *M-901s* for USAREUR, scheduled to be delivered by February 1981.

OPMD - EPMD ARMOR

The following is a list of commanders as of 1 December, 1979 of Marine Corps Tank Battalions and Assault Amphibian Battalions and a Tracked Vehicle Battalion that contains both tanks and assault amphibian vehicles.

LTC A. E. Burns, III
1st Tank Battalion
1st Marine Division

LTC R. C. McInteer
2d Tank Battalion
2d Marine Division

LTC J. D. Sparks
3d Tank Battalion
1st Marine Division

LTC R. H. Dietrich
1st Tracked Vehicle Battalion
3d Marine Division

LTC F. M. Slovik
2d Assault Amphibian Battalion
2d Marine Division

LTC J. E. Harms
3d Assault Amphibian Battalion
1st Marine Division

LTC R. C. Detweiler
4th Tank Battalion
4th Marine Division

LTC W. E. Wean
8th Tank Battalion
4th Marine Division

LTC C. Farnell
4th Assualt Amphibian Battalion
4th Marine Division

OPMD

OPMS—USAR

The Officer Personnel Management System—US Army Reserve (OPMS-USAR) is a centralized personnel management system which provides coordinated individual career guidance, professional development, and assistance to the officers of the Army Reserve, both Individual Ready Reserve (IRR) and members of Troop Program Units (TPU). The final phase of OPMS-USAR implementation began on October 1, 1978, at the US Army Reserve Components Personnel and Administration Center (RCPAC). With completion of the final phase, all 83,000 USAR officers will be under OPMS-USAR's "Management for Mobilization" by the end of Fiscal Year 79.

RCPAC officials say that OPMS-USAR will develop and retain Reserve officers in the right numbers with the right skills to meet the Total Army's critical mobilization needs and make the most effective use of training funds. Current mobilization requirements reflect a need for over 25,500 IRR officers and Standby Reserve Officers in the M to M+30 time period and approximately 40,000 in M to M+60. The IRR officer pool, with an approximate strength of 43,500, is barely adequate to support early deployment mobilization plans, but could increase substantially if the officer discharge rate is stabilized, according to RCPAC planners.

Officials say that OPMS-USAR improves officer readiness by spending training dollars for mobilization related training. Data at RCPAC show that this management system has significantly increased retention rates.

Let's Talk

USAR officers, unit or nonunit, are encouraged to speak frequently to their Personnel Management Officer (PMO), since he is the vital link for training opportunities and career management recommendations. This link is more important now than ever because in these austere times it will be impossible for most officers (non-unit) to achieve a good retirement year through ADT alone. Your PMO will explain the other options for earning retirement points when you call.

Armor Branch

Toll Free 1-800-325-1884

Autovon 693-7871

In Missouri Call Collect 314-263-7871

CMC*		SSAN**
121	MAJ Horsley (Chief)	LTCs
122	MAJ Mark Meyers	00-32
123	CPT Phillips	33-65
124	CPT Sykes	66-99

*Career Management Code (CMC)

**Officers are assigned to a PMO based on the last two digits of their SSAN's.

Mailing Address

Commander
US Army RCPAC
ATTN: AGUZ-OEC-AR (add CMC number)
9700 Page Blvd.
St. Louis, MO 63132

Your Personnel Management Officer (PMO)

The principal duties and responsibilities of your PMO as listed below are provided for your information and assistance:

a. Formulates, supervises, and executes personnel plans, policies, and procedures for USAR officers not on extended active duty.

b. Plans, coordinates, and completes assignments based on

the requirements of the service, the career needs of the individual, and the desires of the individual.

c. Reviews and maintains the Career Management File (CMF) in a standard uniform system, and updates Officer Record Briefs.

d. Determines the desires of the officer through questionnaires, telephone conversations and counseling sessions.

e. Monitors the professional growth of each officer and makes recommendations for future professional development.

f. Monitors officer selection and nonselection for promotion.

g. Participates in special studies and task forces related to assignment matters.

h. Manages the careers of approximately 1200 Reserve officers (unit and nonunit).

Officer Advanced Course-RC (Resident) FY 80

OAC-RC courses for Armor are tentatively scheduled for 15 Jun 80-9 Sep 80 and 24 Aug 80-20 Nov 80. Interested officers should contact their PMO for further information. Prerequisites are: grade of First Lieutenant or Captain, Branch Basic Course completed, interim Secret security clearance, and have not completed 50 percent of any branch course (Nonresident/Resident).

Mobilization Designation (MOBDES) Assignments

MOBDES annual training will receive priority consideration in FY 80 and is, therefore, the best insurance that an officer (especially field grade) will receive a tour of duty this year. Due to promotions, program expansion, and reassignments, vacancy lists are published frequently. Contact your PMO for information on vacancies.

Promotions—USAR

Officers, unit and nonunit, are identified for mandatory promotion the year prior to their promotion eligibility date. (e.g., CPT's eligible for MAJ in '81 will be considered in April '80.) You should notify your PMO at least 30 days before the board convenes if you have not received a copy of your promotion consideration folder (PCF). The additions most officers need to make to their PCF are the last two or three OER's, current leaders of commendation and an official photograph.

FY 80 APL Promotion Schedule

Grade	Date	Education Requirement
1LT-CPT	11 Mar-18 Apr	OBC
CPT-MAJ	6 May-6 Jun	OAC
MAJ-LTC	16 Sep-17 Oct	50% C&GSC
LTC-COL	4 Nov-5 Dec	C&GSC*
Unit Vacancies	3-7 Dec 79	
(all Grades)	7-11 Apr 80	
Held at Army level	4-8 Aug 80	

*C&GSC must be completed within three years after promotion to LTC.

Board results are released 60 to 90 days after adjournment.

NONPARTICIPATION LETTERS

IRR officers who do not earn the minimum number of participation points required for a satisfactory year receive, in addition to their annual points statement, a nonparticipation letter. If you receive one of these computer-generated letters, you *must* answer it. If you do not answer the letter, by law RCPAC must discharge you. Attached to each letter are phone numbers instructing you how to contact your PMO. If you do not fully understand your options or if you desire career guidance, please contact your PMO and ANSWER THE LETTER.

EPMD

EOD VOLUNTEERS SOUGHT

Are you interestea in a challenging and interesting duty assignment? If so, please read on. The Army is looking for enlisted volunteers in the grades E1 thru E4 for Explosive Ordnance Disposal (EOD) duties at installations throughout the United States and overseas.

Those selected will initially be attached to an Explosive Ordnance School at Indianhead, Maryland, for Phase II of their training. This portion of the course lasts 13 weeks. Upon Alabama, which lasts for a period of two weeks. From there soldiers will proceed to the United States Naval Explosive Ordnance School at Indianhead, Maryland, for Phase Two of their training. This portion of the course lasts 13 weeks. Upon graduation from Indianhead, soldiers are awarded MOS 55D10 and the Explosive Ordnance Disposal Badge. In addition to this, soldiers are eligible for $55.00 per month Demolition Pay as of the date they report to Redstone Arsenal for Phase I training. Soldiers serving overseas must complete 5/6 of their tours before returning for training and reassignment. However, applications should be submitted at least 8 months prior to DEROS.

To be eligible, volunteers must have 13 months retainability at the expected time of arrival at their unit after completing training, or extend or reenlist to meet this requirement before leaving their old unit.

In addition, soldiers must meet the mental, medical, and security prerequisites for EOD duties outlined in AR 614-200, DA Pamphlet 354-4 and AR 611-201.

Interested soldiers should forward applications through command channels to: Commander, MILPERCEN, ATTN: DAPC-EPM-L, 2461 Eisenhower Avenue, Alexandria, VA 22331. For additional information call MSG O'Brien at MILPERCEN, Autovon 221-8016/8017, or contact any Explosive Ordnance Disposal Detachment.

Pages from the Past

MONEY NOW OR MEN LATER

We make no bones about spending hundreds of millions on the peacetime development of air forces. Their "flaming coffins" of World War days have long since joined the scrap heap. Not so with our tanks—the slow-moving 10-year-old machines now in the hands of Regular and National Guard troops would be blown to bits by the modern antitank weapons of any first class power. The modern fast tank can run circles around them. No matter what developments may be, it is certain that in any future war there will still be fighting on the ground. The ground troops deserve the best fighting machines that money can buy—and plenty of them. In money now or men later, we must pay the price.

The Cavalry Journal
January 1929

WOODEN SOLDIERS

"Disciplinary drill" seems to have been left far behind. But it is difficult to find an experienced officer who does not believe in the disciplinary value of drill. Originally devised for battle, it has been retained in armies for elementary disciplinary training. It appears to be the best means yet devised of developing group unity and the expectancy of obedience in the early stages of training. In armies where drill has been made an end in itself, it has defeated its purpose. Too much of it develops either resentment or boredom, or an automatism that destroys initiative.

The Cavalry Journal
May-June 1939

THE COMMANDER AND HIS MEN

Discipline and democracy are not exactly harmonious notes. It will be the tact and firmness of the leader, combined with the superior intelligence of the rank and file, that will and must combine to find a solution of this apparently difficult problem. With us there should be less trouble than with most nations in solving the equation. In our army there has always been a paternal relation between the commanding officer and the men under his command. It is the company, squadron, or even troop leader, who must fully recognize how the fight of the future depends upon his intelligence and upon his exertions.

The Cavalry Journal
January 1909

A BRILLIANT FUTURE

Cavalry will in the future, when employed against cavalry, find the *ultima ratio* in cold steel. There are, however, many instances, especially in the great plains of Europe, where the value of mounted men will depend as much upon their eyes and their ears, as upon their arms. It has been the fashion amongst those whose thoughts are vague, to declare that the day of cavalry is past. On the contrary, the sun is rising on its brilliant future.

The Cavalry Journal
January 1909

BOOKS

TIGER JACK by Hanson W. Baldwin. Old Army Press, 1513 Welch, Ft. Collins, Co. 80512. 198 pages, photographs, and appenendices. $10.95.

In the massive panoply of men and arms that clashed in World War II, an army division played a relatively small part. Consquently, while we often can read of the exploits of corps and armies, or read personal accounts of individual soldiers, the divisions—the homes of the soldiers and the building blocks of the corps—remain obscure. Consequently, their commanders remain obscure as well.

This book provides a refreshing insight into this intermediate command. It is the biography of Major General John S. Wood, the commander of the 4th Armored Division. For 2 years prior to the Division's deployment in Normandy until his relief in December 1944, General Wood *was* the Division, molding it as his very personal command. The Division, in turn, reflected his personality—tough, resourceful, aggressive. It epitomized the spirit of Armor; spearheaded Patton's 3rd Army; and produced such leaders as General Creighton Abrams, who commanded the Division's 37th Tank Battalion, and General Bruce Clarke, commander of Combat Command A.

Throughout General Wood's command, the 4th Armored was always pressing forward, never concerned about flanks, and constantly aiming toward the enemy's vital center. Never was this better shown than in late July and early August 1944 when the Division's mission was to assist in clearing the Brittany peninsula. Despite the fact that the German front had collapsed and the road to the east was open, Allied plans called for the capture of the Brest and the other Brittany ports before turning toward the Rhine. Wood saw that now was the time to plunge east, to cut off and destroy the German armies before they could regroup and dig in. The ports could wait, cut off from the rest of the German forces, their garrisons withering like dried grapes.Consequently, while continuing to assist in the Brittany campaign, Wood argued forcefully to be able to turn his division east. Meanwhile, unknown to Patton, Wood sent part of the division east in a "reconnaisance in force." When Patton discovered this action, he exploded; but soon recognized the validity of Wood's arguments, and turned the 4th Armored loose.

This episode exhibits a hint of one of General Wood's strongest characteristics: an intolerance of what he considered inflexible or unimaginative thinking. The trait served him well, for it allowed him to back his troops, to use them effectively and to shield them from the idiosyncracies of remote commanders. This in turn bred a loyalty and esprit in the 4th Armored that was second to none. The troops were devoted to Wood, and willingly allowed him to mold them to his will.

Throughout the book this intolerance of slow thinking is evident. Unfortunately, it did not always foster good relationships with peers and superiors and ultimately led to Wood's relief from command. That episode provides an interesting insight into the conflicts of higher command and a tremendous example of loyalty to subordinates despite great personal risk.

Although the material in the book is interesting and personal and provides a professional look at the successful results of General Wood's leadership, several flaws surface in the writing and organization of the work. The text uses a flash-back style, that jumps from the Division's operations in France to General Wood's early development and career. This technique destroys continuity and the flow of the story. Several anecdotes, quotes, and references are repeated several times at length, giving the impression of reading on one page a paragraph that appeared earlier in the book. Although the photographs are interesting and add flavor to the tale, there are no maps or drawings of the 4th Armored Division's operations.

However, a graphic description of an armored division's operations does spring to life. The training, motivation, instilled loyalty, performance, and trial of its members becomes clear. Finally, the techniques of a successful commander are examined, offering thought-provoking glimpses of the resolution of conflicts that all commanders experience between assigned mission, loyalties, and the welfare of the troops. Overall, the book is an easily-read volume that provides a much-needed look at a division and its commander.

FRAME J. BOWERS, III
Captain, Armor
USAAEFA, EDWARDS AFB

Tank Warfare: An Analysis of Soviet and NATO Tank Philosophy, by Richard Simpkin, published by Brassey's Publishers Limited, London, and Crane Russak and Company, Inc., New York, May 1979. $12.50

This book is good. It is also controversial. This reviewer read it from cover to cover in three evenings and spread the highlights through his organization. The immediate response was an order for four more books.

Brigadier Simpkin has written a timely book that ballparks the quandry in which NATO finds itself. The logic, technology, and facts are devastating (which could be an understatment). Many will probably attack the text. They may find some of its weaknesses such as British pride in HESH, 105-mm and 120-mm APDS, and "Chobham" armor. The pride is well founded; but it has possibly been carried too long in light of the kinetic energy performance of Soviet APFSDS since 1959 and Soviet armor arrays since the *T-64*. The assumptions as to compound armor (Soviet-combined armor, U.S.-special armor) making shaped charge warheads obsolete should possibly be taken with some salt in light of the Soviet deployments of new generations of medium ATGM's.

Attackers of this book will probably not notice that it only presents Soviet hardware and technology as analyzed in Western literature. However, the large amount of Soviet texts on engine, suspension, track, armor, fire control, gun, projectile, etc. design and armor deployment/usage will only drive home Brigadier Simpkin's analysis with a 12-pound sledge. It is no longer amazing that a country that doesn't face an oil shortage and lack of fuel should settle on 40-ton tanks with engines half the horsepower of the West. The book tells you why and how.

NATO and the U.S. are in trouble. Their innovative spirit and government directed free enterprise have only fielded product improvements and generated paper hardware for analyses and approvals. On the other hand, the thought-constrained and regimented Soviets have produced in quantity such radical items as the *BMP, BMD, SP-122,* armored command/support vehicles, *T-64, T-72,* and *HIND-A, -D,* and *-F.* It has not been

obvious for a long time that the West's higher technological quality (if it is up to Soviet standards) can offset the numerical superiority of the Warsaw Pact. As an example, the German "flying tank" concept suggested by Brigadier Simpkin will probably face a 10-year-long analytic gauntlet in the West that will be worse than combat with the Soviet's existing "flying tanks", the *HIND-D* or *-F*.

Simpkin's obvious intent is to ballpark the problems and pitch in a fresh ball. This has been done admirably well. Everyone involved in designing, producing, maintaining, or using armored vehicles (land or air) should read this book soon. Those who make decisions should own one.

JOSEPH E. BACKOFEN, JR.
Battelle's Columbus Laboratories

THE MOSSAD: ISRAEL'S SECRET INTELLIGENCE SERVICE, by Dennis Eisenberg, Uri Dan, and Eli Landau. Paddington Press Ltd., New York and London. 1978. $9.95.

More than just a spy thriller, this collection of true stories reflects the combination of professionalism, dedication, and loyalty of the men and women of Israel's Secret Intelligence Service—the MOSSAD.

Each story, in its own special way, represents a key event in the history of the state of Israel. From the kidnapping of Adolph Eichmann, to the stealing of a MIG aircraft and the Yom Kippur War, the authors relate the meticulous planning, skillful execution of mission, personal bravery, and patriotic endeavors of the MOSSAD.

Not every mission has a successful ending, as the stark realities of espionage are omnipresent and the sudden exposure of an agent often means death. The loyalty of the MOSSAD to its operatives, and the efforts made to extricate its agents, once discovered, are indeed refreshing, as is the sense of patriotism which is a common thread throughout the book.

This book is well written and exciting and while it has limited utility to the military historian tactician, it is one that you will read from cover to cover at one sitting.

FREDERICK A. WALKER
Lieutenant Colonel
U.S. Army

VIETNAM STUDIES: MOUNTED COMBAT IN VIETNAM by General Donn A. Starry, Department of the Army, 1978. For Sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Paper cover. Stock No. 008-020-99646-1. $4.25 paperback, $1.00 postage.

Mounted Combat in Vietnam is the latest contribution to the Army's Vietnam Studies series and is the result of task force efforts initiated in 1973. At that time, the author still commanded the U.S. Army Armor Center and Fort Knox.

The preface leaves no doubt as to the scope of the volume. General Starry freely admits that, "the monograph makes no attempt to document every armored unit in every battle." His goal instead is to focus on key events and highlight representative actions.

Beginning with the unsuccessful French involvement and the experience of U. S. advisers, the chronology continues through the gradual escalation and our ultimate ignominious withdrawal from the conflict. The battles of *Tet '68* and the highly successful Cambodian incursion receive emphasis, as does the initial employment of the helicopter as an antiarmor weapon.

More than just a historical account, this book is a pentrating analysis and critique of military deficiencies. Lessons learned might aptly be regarded as lessons relearned. Armored forces were reluctantly accepted at the beginning of this supposed infantryman's war and, when finally deployed, they were frequently fragmented, piece-mealed, and fought from fixed positions, thus perpetuating the errors of the past. Logistics also proved inadequate for the support of highly mobile forces. General Starry's scathing treatment of combat service support should provide the genesis for actions to place substance behind our current "support forward" doctrinal cliches.

The battle narratives almost evoke a feeling of pathos with respect to our overwhelming materiel and technological superiority. Yet a subtle lesson is sensed throughout, one that must not be lost on our combat and materiel developers. *Mounted Combat in Vietnam* appears to be a story of improvisation—improvised armor protection, improvised recovery techniques, improvised supply vehicles, improvised tactics, *ad infinitum.* Despite the years of research and development which drag out the procurement process, it would seem that the soldier in the field must ultimately redesign the final product. The authors offers the indictment that, "the mine rollers sent to Vietnam were not as effective as some 1945 equipment," and the photograph of sandbagged tank turrets is reminiscent of expedients from earlier conflicts.

Despite attempts by American society to dismiss our Vietnam experience as a historical aberration, the military must not so quickly and completely slam the door, lest we forget and again pay the price. General Starry's account has fortunately placed a foot in that door.

JOHN R. DREBUS
Captain
USAARMS

ANTIQUE FIREARMS by Frederick Wilkinson. Presidio Press, San Rafael, California, 1977. 276 pages, $14.95.

When writing books on any technical subject it is quite easy to author a book of limited usefulness. Such books are either so general and simple that the scholar shuns them or so technical that the beginner can't understand them. Mr. Wilkinson has avoided these two extremes.

Antique Firearms begins with the development of black powder and the first handheld weapons using it. The reader is then led through matchlock, wheellock, flintlock, and percussion. Along the way there are many entertaining and informative diversions into variations such as duelling pistols, blunderbusses, and pocket pistols. Toward the end, the development of the cartridge case and breechloading weapons is covered. Save for one photograph of a Winchester 1886, there is no mention of anything past the 1870's.

Mr. Wilkinson writes well, his book is well organized and does not suffer from an aloof technical style. The numerous plates of firearms are outstanding. They are clear, show detail well, and are probably worth the price of the book themselves.

For the dedicated student of firearms, or for the beginner who wants a book that will allow him to hold his end of a conversation, one cannot go far wrong with *Antique Firearms.*

ARTHUR B. ALPHIN
Captain
Rice University

ANTITANK WARFARE by Major General G. Biryukov and Colonel G. Melnikov. Progress Publishers, Moscow, USSR. First Printing 1972. 155 pages. no price indicated.

What does our primary potential opposing force say about armor? In a very readable 155-page volume printed on quality paper with a "weather proof" plastic cover, Soviet Major General Biryukov and Colonel Melnikov mix history with projected developments, and solid tactics with party-line polemics to present some fascinating insights in *Antitank Warfare*. This volume is being "dumped" into the Middle East for the incredible low price of the equivalent of 34 cents in US money. In an environment where books bring prestige and are often expensive, the Soviets are selling professional books on military science, engineering, medicine, and other professional subjects in English, Arabic, Turkish, and other languages to project their influence.

For the American soldier concerned with countering the Soviet armor threat, who cannot obtain this book, portions of the Soviet authors conclusions are quoted: "The rapid development of tanks has transformed them from a weapon of direct infantry support into the main striking force and has made them one of the most powerful factors in the armed struggle between ground forces in nuclear war, and especially, in non-nuclear combat operations. Tanks have not only become the most formidable ground combat vehicle, but have also brought into being various other armoured vehicles. This has made it possible to organise powerful armoured forces and reinforce with tanks and armoured vehicles the organisational structure of motorised infantry, mechanised infantry, mountain infantry, airborne and other troops. The increased viability, combat readiness, mobility and firepower of these troops have significantly altered their tasks and methods of conducting combat operations, and have made it possible to exploit the results of rocket nuclear attacks to the full and complete the rout of the enemy. The development of weapons and methods of combat calls for a sharp improvement in moral, psychological, technical, and physical training of all personnel."

Some of the numerous thought-provoking comments of the Russian writers of this important volume include these points which must be stamped into our consciousness:

• The "possible wide use" of nuclear weapons "fundamentally alters" the character and course of combat operations.

• With "rocket-nuclear weapons" attacking forces can "inflict heavy blows on the enemy, develop high manoeuvrability on the battlefield and successfully perform combat missions in far shorter periods of time than during past wars."

• Tanks "possess very high firing and striking power, high mobility, good armour protection and considerable resistence to the effects of nuclear weapons."

• The "enhanced role of tanks accounts for the continuous increase in their numbers and improvement of their combat characteristics."

• The Soviet authors stated that "15 to 20" tanks and "20 to 30" APCs must be allocated "per kilometre of front line."

• A "distinctive feature" of future battle will be "mass use of tanks and armoured carriers."

• The "side which possesses modern nuclear weapons, tanks and other kinds of armament, as well as the corresponding means and methods of combatting them, may count on success in combat."

• If "no mass destruction weapons are used, direct fire will continue to be the principal means of fighting tanks, and the decisive role will be played by special antitank weapons and tanks. The task of destroying tanks on distant approaches to the forward line of defence will still have to be performed by aircraft and artillery."

In discussing Soviet experiences in World War II, the authors maintained that the "struggle against tanks" required the appointment of an "all-arms commander." They also stated that Soviet commanders adopted a "creative approach to the problems of anittank defence, taking into account the combat situation in each specific case."

The mine of comparative date, tables, illustrations, and technical discussion in this book does not exclude party polemics. Table 9, for example, is entitled "Antitank Guns of Capitalist Armies." In a discussion on the Korean War, the authors claimed that the American bazookas were "useless" because of "panic." They alleged that: "When tanks of the Korean People's Army came closer than 400-300 M the American soldiers wavered, abandoned their bazookas and fled to the rear."

General Biryukov and Colonel Melnikov did not neglect the importance of solid training and willpower to counteract "tankophobia" and the "temporary setbacks suffered by Soviet troops," the "inadequate training" and "poor results of antitank combat" such as that experienced early in the "Great Patriotic War."

The writers of this vitally important tool to understanding our potential opponent give us a clue to our own training efforts, the "higher combat principle" of "winning by skill rather than number."

Read this volume closely for clues to Soviet insight, as well as its effects on their client states where aspiring Third World officers are getting more than their 34 cents worth!

EPHRAIM E. WALLER
Lieutenant Colonel
School of International Studies
USAIMA, Ft. Bragg

LEGIONNAIRE: MY FIVE YEARS IN THE FRENCH FOREIGN LEGION by Simon Murray. Times Books, New York, 1978. 314 pages. $9.95.

At last we have a book about the modern French Foreign Legion written by a real English legionnaire who actually served his entire 5-year hitch, although he never mentions his Legion *nom de guerre.* Simon Murray pulls no punches; he describes the Legion exactly as he saw it; not as treacherous cutthroats and thieves, nor as the spit-and-polish *troupes d'elite,* but as a far more uniquely complex organization lying somewhere between the two.

Readers can follow this modern-day Beau Geste into a world as remote from contemporary American life as living on the dark side of the moon. *Legionnaire* is written in diary form and recorded as the author witnessed the events. The enlistment in Paris, the wait in Marseille, the trip to Algeria, basic training, pre-parachute instruction, jump school and assignment to the crack 2e REP (Regiment Etrangere de Parachutistes.), and the frightful account of the war against the *fellagha* of the FLN (Front de Liberation National). The countless marches across the Algerian mountains, the relief and excitement of combat, the hardships, death and solitude of an often senseless existence, brutal discipline, filthy living conditions, meaningless destruction, blind drunkenness, as well as pride, courage, and self-sacrifice are hallmarks of this true life adventure.

Much has been written about the Foreign Legion but never as evenhandedly and descriptively as in *Legionnaire.* Very little has reached the public concerning the modern Foreign Legion; most of the old Legion books are fiction, or worse yet, written by deserters.

Simon Murray has gathered together his story with scholarship and humor.

His many descriptions bring back memories for anyone who has had like experiences and nothing but respect from those that have not:

"Coldness is enemy number one—hunger and heat are tolerable but cold kills morale. The misery of crawling into a sleeping-bag which is wet and sodden in total blackness on top of a mountain with the rain pissing down and the wind howling and people in great galumphing mud-chocked boots wandering around tripping over each other, with boxes and poles and equipment lying everywhere in total chaos, is misery without parallel. And when on top of that somebody tells you that you are on guard duty from 0300 until 0500, well then you throw."

The Legion wins the battles in the mountains and the maquis, but the battles on the battlefield are not the ones that count: General DeGaulle's actions, forever condemned by the Legion; the abortion of the *Generals' Putsch* and the last hope of keeping Algeria French; the rumors of certain disbandment; the desertions to the O.A.S. (Organisation de l'Armee Secrete), and the search for a *raison d'etre* are vividly recorded.

Peace! The Legion is suffocating! No purpose! Murray hangs on—Corporal's school, more Legion discipline, more conflicts, courage, humor and a triumph of the spirit, the same spirit which has brought the Legion through its crisis and back into its own.

Legionnaire is well written and vibrantly characterized, and Murray's accounts are often spiced with English dry wit and a haunting sense of helplessness.

WILLIAM M. BROOKS
650th Transportation Co.(TT)
USAR

BRASSEY'S FAST ATTACK CRAFT. Edited by John Marriot. Crane, Russak and Company, Inc., New York, 1979. 263 pages. $24.50.

The advent of the surface-to-surface missile has given to fast attack craft capability all out of proportion to size, and thus making them an important factor in naval planning. Indeed, a vessel of a few hundred tons can now engage a ship many times her size AT THE SAME RANGE. This capability, at a fraction of the cost in both capital and manpower, has enabled many smaller countries to float relatively formidable naval forces.

In the introductory chapters of this volume, the editor has explained the hull types, propulsion systems, weapons systems and sensors in use in fast attack craft. Also included is a chapter on the tactical employment of these craft. Detailed descriptions are then provided of all fast attack craft currently in service: propeller-driven corvettes, missile boats, gunboats, torpedo boats and patrol boats and the hydrofoils and hovercraft now coming into service in these roles. There are appendices that list all fast attack craft by country, compare NATO vs Warsaw Pact missile boat strengths and describe the most important projected fast attack craft.

The book is knowledgeably written, well organized and easily read. Additionally, the editor is careful to differentiate between fact and opinion. It provides a comprehensive picture of the type, the data being complete as of the end of 1977. It is a good book to read for anyone wishing to gain an understanding of the importance of these potent little ships.

Commander HENRY F. DALTON
Commanding Officer
USS Johnston (DD-821)

NATO'S FIFTEEN NATIONS SPECIAL: NAVAL ISSUE. Jules Perel's Publishing Co., Amstelveen, Netherlands. 1978. 152 pages. Hfl 13.50.

This special issue is edited by Captain John Moore, R.N. (Ret.), Editor of "Jane's Fighting Ships," who is also Naval Editorial Adviser to NATO'S FIFTEEN NATIONS. It contains an analysis of the strategic problems facing NATO at sea, descriptions of the various commands, and of the naval forces of the member countries. A number of vessels and equipments are described.

All NATO countries, except Luxembourg which has no navy, sent contributions, usually by the heads of their service. They recount the history, organization and problems of their own navies. Among them, Admiral R. H. Falls, Chief of the Canadian Defence Staff, shows how his national forces contribute to the naval forces of the Alliance and cooperate with those of the United States in the defense of North America. The Chief of Staff of the Belgian Navy, Vice Admiral Van Dijk, proves the truth of the statement by King Leopold II that a small country bathed by the sea was not a small country. Vice Admiral B. Veldkamp, Commander-in-Chief Royal Netherlands Navy shows how the "gateway" function of Holland has contributed to the present day.

Equipment reviewed ranges from NATO submarines, fast attack craft, mine countermeasure vessels and missiles, to guns and torpedos as well as radars and sonars.

SOUTHERN AFRICA STANDS UP: THE REVOLUTIONS IN ANGOLA, MOZAMBIQUE, RHODESIA, NAMIBIA, AND SOUTH AFRICA by Wilfred Burchett. Urizen Books, New York. 1979. 321 pages. $12.95 hb, $5.95 pb.

For more than 35 years, the Australian Communist journalist Wilfred Burchett has been a prolific writer on revolutions and wars; this is his twenty-eighth book. For many years, Asia, particularly Korea and Vietnam, was his primary concern. In the last few years, he has turned his attention to Africa. This book is an outgrowth or follow-up to his *The Whores of War* (1977), a polemic against white mercenary forces focusing on European involvement in African wars of national liberation.

Southern Africa Stands Up is divided into three parts: one on the background of the national liberation war in Angola, another on Mozambique's revolution, and a composite chapter surveying the struggles in Zimbabwe, Namibia, and South Africa. The author is obviously sympathetic with the Marxist revolutionaries and he has unique access to their leadership. The book is a strange mixture of historical narrative, vignette interviews with revolutionaries (both leaders and peasants), and revolutionary manifesto. A detailed chronology and several maps are valuable appendices.

Although the work has some interest and value because of the author's access and perspective, it is not an objective nor scholarly treatment of the subject. While the tone is not as strident as in other works by Burchett, his interpretations and even his factual narrative are most questionable. As with most ideologues, the dichotomy of good and evil forces is too stark, too simplistic. Burchett proclaims that the leftist revolutionaries are well intentioned and reasonable men driven to violence and other extremes entirely by the white colonialists and by clandestine American intervention. While there may be much truth to this contention, the issues are much more complex than this facile explanation. In essense the book is a political tract. Readers wishing a somewhat more objective introduction to the crises of Southern Africa would be better advised to begin with Gwendolen M. Carter and Patrick O'Meara, eds., "Southern Africa in Crises." Burchett's book is not without merit, but it should be read with a high degree of skepticism.

Dr. JOE P. DUNN
Head, International Affairs Program
Coverse College

ROMMEL IN NORMANDY by Friedrich Ruge. Translated by Usula R. Moessner. Presidio Press, San Rafael, Calif., and London, England. 1979. $12.95.

When one thinks of Erwin Rommel, the thoughts usually center on his image as the "Fox of the Desert," since for most of the contemporary world, Rommel and warfare in North Africa are synonymous. The flamboyant combat leader, directing the "Afrika Korps" from his personal *SdKfz* 250/3 command vehicle, became a respected and hated foe of the Allies in the early days of World War II.

There was however, another Rommel: the Rommel who commanded the German efforts to disrupt the invasion of France; the Rommel who might have become the post-war leader of Germany had the assassination attempt on Hitler been successful. This Rommel is pictured with moving detail and great admiration in these reminiscences by Admiral Ruge.

In the position of Naval Advisor to the Field Marshal, Ruge was uniquely qualified to observe Rommel the man, as well as the military leader. Ruge reports, in concise, well-ordered style, how Rommel dealt with the problems of readying the hodge-podge of available German units for the inevitable invasion of "Fortress Europe" by the British and Americans. The reader finds that Rommel was blessed with the kind of personality that allows its owner to exude confidence and infect men, from generals to privates, with a positive spirit regardless of seemingly impossible odds. Rommel expressed this "can do" attitude on most occasions, according to Ruge, and was able to gather the limited resources available to him into a viable defensive force.

The problems of having to deal with Hitler, and the General Staff (OKW) in Berlin, are outlined with clarity and perspective, and Ruge comments extensively on Rommel's private agony with relation to his feelings about Hitler as opposed to his love for his men and for Germany. Rommel's personal standards are also brought to light. His dislike for frivolity and undue fanfare are underlined by Ruge as he describes the numerous cross-country train and auto trips made by Rommel and his staff in order to inspect and reinforce the ocean-front from Denmark to the French Mediterranean coast. It is additionally stated that Rommel's involvement in the plot of July 20, 1944 was kept from most of those around the Field Marshal, including the author, but many comments were made in private to Ruge that plumb the depths of Rommel's distast for the lack of leadership and the general decay in Berlin.

Ruge concludes that, had Rommel been given a completely free hand with regards to the blunting of the Allied offensive on the beaches, the landings could have been contained and perhaps defeated. This is, of course, speculation; but the facts are that Rommel was defeated not only by superior Allied materiel and depth of planning, but by Berlin's inability to stop meddling in the tactical and strategic decision making.

The book is valuable in that it fills a gap in our general background knowledge of the German preparations to blunt the Allied landings in the West. The information about Rommel's involvement in the assassination plot and the insights into his unique personality are bonus materials and should please the historian and layman alike.

The maps and photographs are of excellent quality and lend perspective as the 7 months prior to June 6, 1944 are described in a day-by-day fashion. Much attention is given to the development and deployment of mines and obstacles by the Germans in the antiamphibious landing role. This information is invaluable to the weapons' historian and the student of modern riverine and coastal-defense warfare.

As a primary resource dealing with the pre-Normandy landing period from the German side, the book is remarkable in its depth and readability. As a testament to Erwin Rommel, it is further proof that he was all, and more, the substance of the legend that has grown up around him as the "Fox of the Desert."

ROBERT P. ARNOLDT
Oakpark, Ill.

Recognition Quiz Answers

1) GERMAN *RAKETE (RJPZ-2)* M-1966 (no turret, two retractable launchers for *SS-11* and antitank missiles, 12 additional rockets carried inside, same chassis and similar performance as SP gun *Kanone)*

2) BRITISH COMBAT ENGINEER TRACTOR *FV-180* (shown carrying metal trackway, can also lay the track, tow and fire *Viper* minefield breaching device, and operate rocketpropelled anchor, in addition to usual tasks of engineer vehicle)

3) US *XM-1* MAIN BATTLE TANK (angular sloping turret, 105-mm gun with bore evaculator and thermal jacket, boxlike structure on top right turret)

4) GERMAN *LEOPARD* ARMORED ENGINEER VEHICLE (auger for digging foxholes, blade for bulldozing and grading, equipped with winch for recovery operations)

5) FRENCH *ALOUETTE II* HEICOPTER (three-bladed rotor, turbine powerplant, enclosed cabin, steel lattice frame and tail boom)

6) SWEDISH *IKV 91* LIGHT TANK (90-mm low pressure gun, 7.62-mm coaxial machine gun and another mounted on the loader's cupola, sharply-slanting glacis, has track skirts).

THE ARMOR DESK

My thanks to all of you who took the time to complete the readership survey contained in the May-June edition. Especially gratifying were the number of completed surveys from our junior enlisted readers. Time has not permitted me to respond to all your comments, but I can assure you that all comments and suggestions are being evaluated.

Overall you rated **ARMOR** *as a very professional military journal. You liked our mixture of articles, the language, and the artwork. Many of you expressed an interest in seeing* **ARMOR** *monthly.*

You also provided us with some very thoughtful and positive criticisms. For example, you cited too many typographical errors, black print on red ink, and the magazine too often geared towards the officer.

A number of you requested more articles on Threat equipment and tactics, small unit tactics, and unit histories.

Not surprising, but never-the-less disturbing, was the lack of interest that you indicated for articles on logistics, maintenance, personnel, and communications.

History is replete with commanders who have lost battles and even wars by their lack of interest in or disregard for combat service support. In the Nov-Dec issue of **ARMOR,** *there was an excellent article, "Lines of Torres Vedras," in which the author cited the difference in Wellington's and Massena's approach to combat service support. Wellington's success in the Penisular Campaign was in part attributed to his concern for the combat service support for his army.*

The staff of **ARMOR** *is pleased with the results of the survey. The credit, however, goes to you who support* **ARMOR** *with your articles, letters, and suggestions on how to improve the magazine. Without you,* **ARMOR** *would be an endangered species. Your support is greatly appreciated.*

The staff doesn't plan on standing on its laurels either. Though no significant changes are planned for **ARMOR,** *we will try to bring you more of the type articles and features you requested. Do note the changes to the inside of the front cover. They reflect the reorganization of the U.S. Army Armor Center and School which became effective January first. We plan in a future issue to discuss the reorganization.*

To the Armor Community, especially those assigned to U.S. armored and cavalry units around the world, the **ARMOR** *staff wishes for you many blessings for the 1980's.*

FWS

Coming in ARMOR

HISTORY OF FIRE CONTROL

Putting steel on target is what it's all about to gunners, and an important factor in doing so is the fire control system. Captain Michael R. Matheny traces the development of fire control systems from simple telescopes fastened to the gun to the modern ballistic computers found in today's tanks.

KINETIC ENERGY PENETRATORS VERSUS ARMOR

In the second in a series of articles on tanks and the technologies of armor penetration, armor and survivability, Joseph E. Backofen examines the development of kinetic energy rounds, and the armor developed to defeat them.

COVERING FORCE OPERATIONS

The employment of an armored cavalry regiment as a corps or division covering force has become doctrinally routine. In Exercise CERTAIN SENTINEL, a part of REFORGER 79, the 2d Armored Cavalry Regiment was deployed in that role, and Colonel Robert E. Wagner, commander of the 2d ACR, discusses the operation and the conclusions reached by him and his staff.

THE INVISIBLE WEAPON

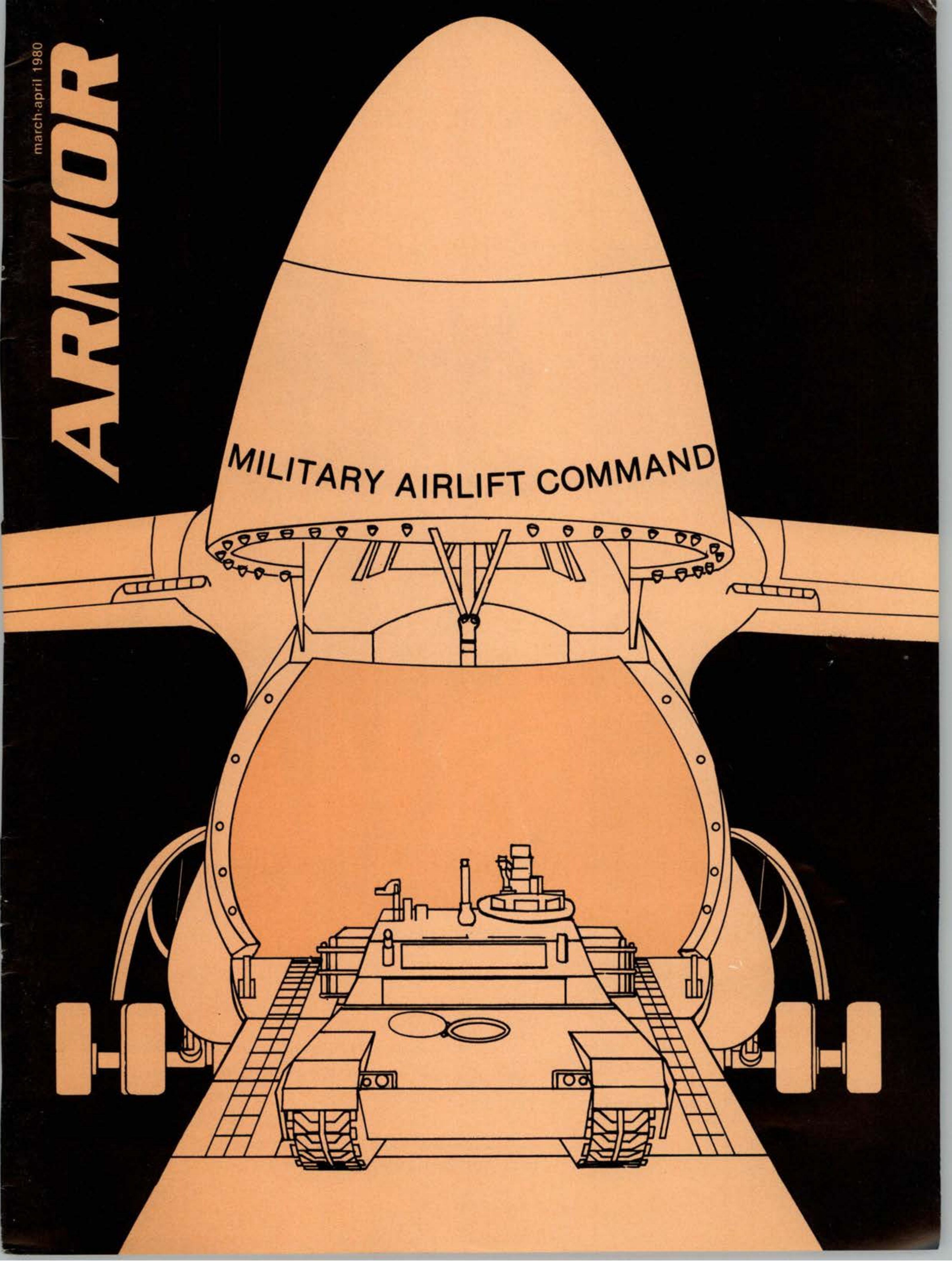
Wars have been won when the odds were against any chance of winning, because that side possessed an invisible weapon—good soldier morale. Major Edger L. Smith III looks at some historical examples of how battles and wars were won against stronger forces because the winning side had an understanding in why they were fighting, and believed in their cause.

TRAIN ALONE

Second Lieutenant David F. Rich describes a training program in the 1-66 Armor that allows platoon leaders to be directly responsible for the field training of their platoons.

ARMOR

march-april 1980



US ARMY
ARMOR CENTER and FORT KNOX

Commanding General
MG THOMAS P. LYNCH

Deputy Commanding General
BG JOHN P. PRILLAMAN

Chief of Staff
COL DUANE R. TAGUE

Command Sergeant Major
CSM WILLIAM R. PRICE

Deputy for School Activities
COL WILLIAM F. COAD

Deputy for Educational Technology
DR. CHARLES W. JACKSON

Director, Office of Armor Force Management
COL MOWTON L. WARING, JR.

INSTRUCTIONAL DEPARTMENTS

Maintenance
COL JAMES L. MARINI

Command and Staff
COL HAROLD L. PAGE

Weapons
COL ROBERT A. PLANT

Committee Group (BT)
COL REID A. BARRETT

NCO Academy/ Drill Sergeant School
CSM BENJAMIN E. PEACHER

DIRECTORATES

Combat Development
COL JIMMY L. PIGG

Training Developments
COL RICHARD L. COFFMAN

Armor Doctrine
COL JOHN H. KIRKWOOD

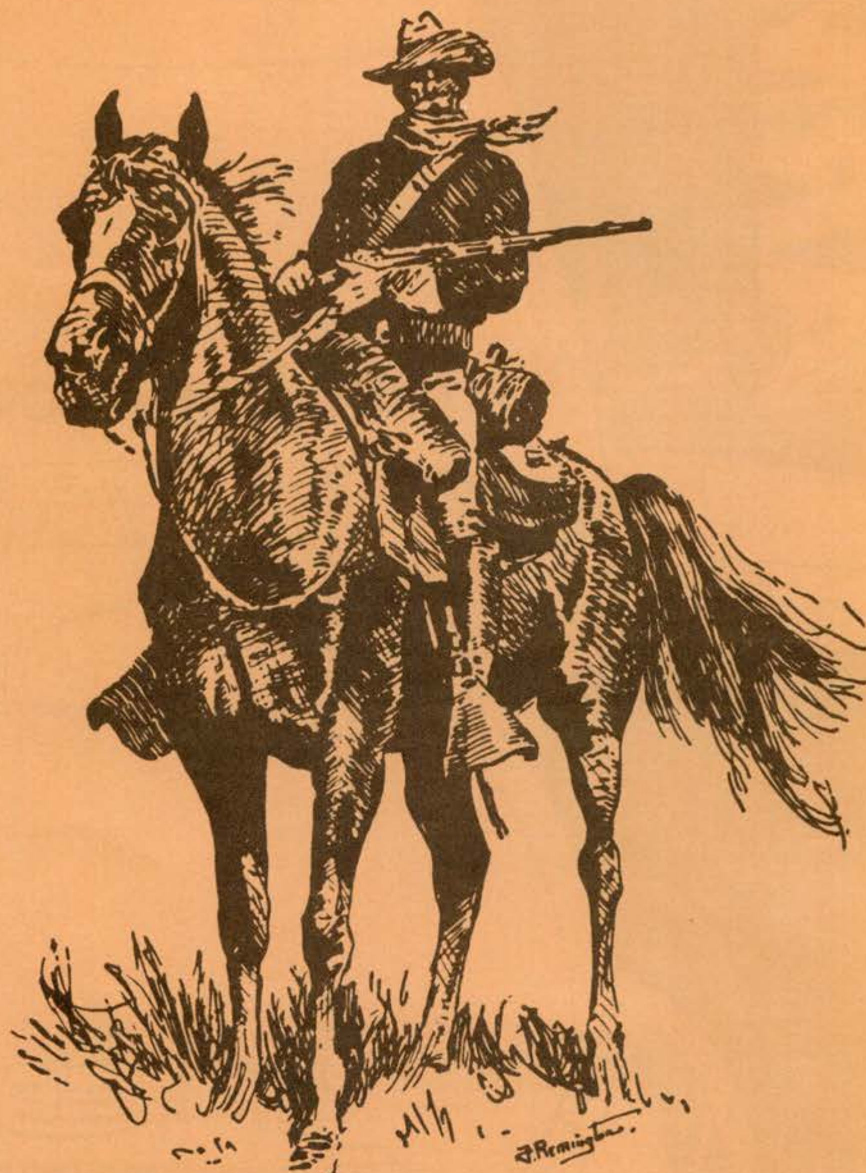
Armor Aviation
COL ROBERT A. HEFFORD

UNITS

The Lightning Brigade
COL ROY C. PRICE, SR.

1st AIT/OSUT Brigade (Armor)
LTC A. W. KREMER, JR.

4th Training Brigade
COL ERNEST D. JOHNSON



"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare; to promote professional improvement of the Armor Community; and to preserve and foster the spirit, the traditions, and the solidarity of Armor in the Army of the United States."

ARMOR

MARCH-APRIL
Vol. LXXXIX. No. 2

the Magazine of Mobile Warfare

Editor-in-Chief
LTC FREDERICK W. SHIRLEY

Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
JEANNIE BRIGHT

ARMOR Magazine is published bimonthly by the U.S. Army Armor Center and Fort Knox at 4401 Vine Grove Road, Fort Knox, Kentucky 40121, to stimulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters. Unless otherwise stated, material does not represent official policy, thinking, or endorsement by any agency of the U.S. Army. Use of funds for the printing of this publication have been approved by the Department of the Army, 23 February 1979.

SUBSCRIPTION RATES: Individual subscriptions to **ARMOR** are available through the U.S. Armor Association, Post Office Box O, Fort Knox, Kentucky 40121. **Domestic:** $8.00 one year, $15.00 two years, $22.00 three years. **Foreign:** $10.00 one year, $18.00 two years, $26.00 three years. Single copies, $1.50.

CORRESPONDENCE: Address all correspondence to U.S. Army Armor Center and Fort Knox, ATTN: ATZK-MAG, Fort Knox, Kentucky 40121. (Telephone: AUTOVON 464-2249 or commercial (502) 624-2249.)

POSTMASTER: Controlled circulation postage paid at Indianapolis, Indiana, Department of the Army, DOD 314.

ARMOR may be forwarded to military personnel whose change of address is caused by official orders (except to APO addresses) without payment of additional postage. The subscriber must notify the postmaster.
USPS 464-510

COVER

In an article beginning on page 30, Lieutenant Colonel Fred C. Cheatham discusses the logistical support of the 194th Armored Brigade during Exercise AUTUMN SAFARI.

LOOKING AHEAD

In his article "Current Soviet Perspectives," Professor John Erickson offers a fascinating look at Soviet Combined Arms as described in the Soviet military press, and covers some of the divergent views expressed by Soviet military writers on the subject.

CFV not for the Scouts

Dear Sir:

I must most heartily echo the comments made by Staff Sergeant Bunce in his letter in the November-December 1979 issue of ***ARMOR.*** The *XM-3* Cavalry Fighting Vehicle (CFV) is a great vehicle. A great vehicle for someone, *but not for scouts*!!! Perhaps it has its place in the combat support company of the mechanized infantry battalion, perhaps in the mechanized infantry company itself. It should provide an effective support vehicle used in conjuction with its brother the *XM-2* Infantry Fighting Vehicle (IFV).

The scout needs something lighter, faster, and (for God's sake) less tempting. Equipped with CFVs, a divisional cavalry squadron would out-gun the line battalions! What commander will pass up the firepower of the *XM-3*?

Maybe one answer is contained in the same issue of ***ARMOR:*** the Canadian family of general purpose armored vehicles (AVGP). Give the regimental cavalry squadron one troop of CFVs and three troops with a mix of *Cougars* and modified *Grizzlies.* The divisional cavalry squadron might get the modified *Grizzlies* and another vehicle based on the AVGP hull and CFV turret.

Somewhere in our army there is a need for a BRDM/BMP killer. I say that the cavalry is the place to fill that need. Give our scouts a vehicle that can out-run and out-shoot the enemy scout, without tying him to a "Weapons System" designed to engage main battle tanks. Someone once defined an elephant *as a mouse built to government specifications.* By that same analogy the *XM-3* is a scout vehicle built to government specifications.

I'm a tanker by trade, and have served in a regimental cavalry squadron. Tanks belong in tank battalions. Scouts, scout vehicles, and scout support vehicles belong in the cavalry squadrons. Give the cavalry a light, fast, *small* scout vehicle and back it up with a support vehicle that can at least *almost* keep up. I didn't like the *M-551,* but at least it would (usually) float!!

While the basic combat mission of the Army may well be to move, shoot, and communicate; the mission of the scout can better be listed as move, communicate, and *if absolutely necessary* shoot. True, there are valid economy-of-force and reconaissance-in-force (raid) missions for the cavalry, but these can be accomplished without the high technology, high cost, and overwhelming firepower of the *XM-3.* If a 3-km tank-killing capability is needed for a particular mission, attach TOW vehicles to a cavalry troop. Don't mount them on top of every scout's vehicle just in case he might some day be about to be decisively engaged by an enemy tank 3 *kilometers* away.

THOMAS P. CURRIE
Staff Sergeant
1st AIT/OSUT Brigade, Armor

Define the Scout's Mission

Dear Sir:

After reading Staff Sergeant Bunce's letter, I felt this needed to be said now. A scout needs a vehicle that is mobile and survivable, and has the firepower needed to accomplish the mission.

Table 1 lists scout vehicles past, present, experimental, and future. I picked the German WW II *Luchs* because in my opinion it is the best scout vehicle of that time and compares well with the vehicles actually used or to be used.

Mobility—The width and height of a vehicle are the major inhibitors to movement in Europe today, with 2 to 2.2 meters the optimum size. Weight is not that important anymore, but should be kept as low as possible. An amphibious ability would be nice, but not a necessity as the banks of almost all rivers and streams make it impossible to ford. A speed of 10 kmph is quite enough. The speeds when climbing slopes need to be greatly improved. Wheeled vehicles are out because of their poor trench-crossing ability unless you use an 8x8 vehicle, and there goes your size. A trench crossing of 2 meters and a step of 1 meter is needed. A motorcycle attached to each scout vehicle can make up for anything tracks cannot.

Survivability—This is a function of being able to resist fire. The smaller the vehicle the better, but size alone cannot protect you. Your armor must be able to stop the expected weapons within the limitations of size, including artillery fragments, mines, small arms, automatic guns, and light antitank weapons. Larger weapons will have to be defeated by tactics.

Firepower—A scout must be able to defeat *all* types of targets he can expect to encounter. If he can not, then other forces must be brought in to do the job and that detracts from the overall picture. Armament should be a machinegun for personnel, an automatic gun for light armor, and a missile for heavy armor targets. Artillery can not destroy or suppress everything and will not always be available. It is also sometimes impractical because of the short engagement times. The armament is there to protect the scout. He will not always see the enemy first. If trained properly, the scout can use this firepower to his advantage. Some of the missions a scout performs *require* the use of firepower. It is very unnerving to run up on a tank with a *M-113.*

One reason we have a problem with picking a good scout vehicle is because we have incorrectly defined the missions of a scout in relation to the present battlefield. When we do that, we will know what is needed.

CHRISTOPHER F. SCHNEIDER
Sergeant
Troop A, 238th Cavalry
Indiana National Guard

Table 1

	Pz II Luchs	*M-113A1*	*XM-800*	*XM-808*	*XR-311*	*XM-3*
tons	12.9	12.05	9.5	10.2	3.05	23.5
kg/cm²	.75	.54	.42	.42	.49	.52
trench (m)	1.75	1.68	1.83	1.64	. 8	2.54
step (m)	.7	.61	.76	.9	.2	.91
HP/ton	13.8	17.8	29.5	56.0	61.3	21.3
width (m)	2.47	2.69	2.44	2.67	1.93	3.2
KPH	80	68	88	105	129	66
armor	20-30mm	6mm*	8mm*	8mm*	----	11-23mm*
weapons	20-mm 7.92-mm	.50 cal	20-mm	20-mm	.50 cal	25-mm 7.62-mm TOW

*Armor is listed as steel equivalent.

Time to get on Board

Dear Sir:

I wish to add some of my own insights in response to the letter written by Staff Sergeant Peter L. Bunce in November-December 1979 issue.

It is unfortunate that SSG Bunce has taken such strong exception to the Cavalry Fighting Vehicle (CFV). While I'm sure he is reflecting his own personal feelings, I'm not sure that he has thought the problem completely through or has envisioned the European battlefield as it might be in the 1980's and 1990's.

The first point raised by SSG Bunce is vehicle size. There can be little argument that the CFV is large for a scout vehicle. The overriding consideration in relation to size was tied to the Cavalry Scout *Ad Hoc* Committee Study (1974), which concluded we needed five scouts per vehicle in order to accomplish the scout mission. In order to get five men and their associated equipment around on the battlefield, you have to provide room in the vehicle.

We wanted increased survivability for the crew and that meant special armor, hence more vehicle. We needed mobility equal to or greater than the *XM-1* and that required an engine, transmission, and suspension configuration that took more space.

While concern for size is valid, the idea of "sneak and peak" scouting has long outlived its usefulness on the modern battlefield. Sophistication has seen to that. With heat sensors, thermal sights, people sniffers, electromagnetic signatures, acoustical sensors, improved optics and so forth, the fact of the matter is you cannot sneak up on anybody.

Correct scouting techniques (dismounted), coupled with common sense, will be the tools the scout needs to survive—not a smaller vehicle.

On the topic of vehicle armament, I can only add that part of what is currently on the vehicle was mandated by our leadership in very high places and that's what we have to live with. We face a heavy threat in Europe and "heavy" scouts make good sense. As for "shooting tanks at 3,000 meters," SSG Bunce has touched on a sensitive point. If you think you have to shoot at every tank you see, you probably will.

On the other hand, a *properly trained* scout crew (SSG Bunce's job) should possess the knowledge of when to shoot and the discipline to enforce that knowledge. The antitank capability does not equate to a dedicated antitank force. Proper employment, a direct result of training, must start with the senior commanders and go down to the crew. Don't forget that the *BMD* and *BMP* reconnaissance vehicle, which SSG Bunce praises so highly, is also equipped with a cannon capable of defeating armor. It's really a matter of training.

The *XR-311*, or an equivalent, for scouts in the light, airborne, and air mobile divions, is a great idea and one that is being looked at by the Armor Center in conjunction with several ongoing studies. But again, we must remember the threat in Europe is heavy. We need heavy divisions and regiments to counter it and the scouts need to "heavy up" if they are to survive.

It should be clear to tankers and cavalrymen everywhere that the CFV does in fact leave something to be desired as a full-fledged scout vehicle. But the reality is that it's the only alternative to the *M-113* and all we have been offered with which to do the job. Make no mistake about it—it is better than the *M-113* and represents the level of technology we must take to war in the 1980's if we are to win.

It is time to get on board! Instead of criticizing the CFV, start thinking out how you are going to train with it and employ it in conjunction with its five-man crew. If you can't do that, then at least don't hinder what progress we are making. Your opinion counts—make it positive.

The cavalry is under attack in many places. If we don't clean up our act and start talking with a unified voice, the only cavalry we'll know is what we read about in history books.

MARC A. KING
Major, Armor
USAARMC

(See Major King's "Professional Thought" on the CFV on page 47. ED.)

Research on 1-69th Armor

Dear Sir:

I am doing research for an article on the 1st Battalion, 69th Armor. As the battalion no longer exists, dealings with official records sources have been frustrating or fruitless.

I hope that those readers of your excellent magazine who are Vietnam veterans of the 1-69th might drop me a line concerning further informational sources or personal/general recollections. I would especially like to contact my one-time tank commander, Richard C. Hasty. I believe he was in an OCS training unit at Ft. Knox before shipping out in 1967. He was the Second Platoon Leader, Company B.

One-time battalion commander, retired Colonel Theodore S. Riggs, Jr. has passed along a helpful letter summarizing several of the unit's engagements, and LTC Timothy J. Grogan has kindly sent a copy of his 1968 article in ***ARMOR*** detailing the battle in and around An Bao I and An Bao II.

I would appreciate hearing from any of you who rode on, broke track on, cussed and fought on the *M-48A3*s of the Black Panthers of 1/69th Armor.

JOHN B. DWYER
430 Westbrook
Dayton, Ohio 45415

Combined Arms

Dear Sir:

Due to the generosity of a fellow commander, who happens to be the division's cavalry squadron commander, I received a copy of the September-October [1979] ***ARMOR*** Magazine. To my great surprise, I saw that the cover displayed a *Chaparral* launcher firing a *Chaparral* missile. Therefore, I was eager to open the magazine and discover what wisdom was being promoted about the "steel umbrella" of Air Defense provided by the divisional *Chaparral/Vulcan* battalion. I am sure that the tankers who read the article found it enlightening.

Seriously, I was pleased to see such an article. We Air Defenders suffer from a lack of understanding on the part of our sister branches. I am glad that the Armor community realizes Air Defense is a viable member of the Combined Arms Team.

DWIGHT K. ROBINSON
Lieutenant Colonel, ADA
5th Bn, 52d ADA

More Combined Arms

Dear Sir:

I would like to request membership in the U.S. Armor Association and receive an individual subscription to ***ARMOR*** Magazine. As an Infantry officer and ROTC instructor, I find the periodical an excellent teaching vehicle and source for up-to-date combined arms doctrine and developments. Thank you for your continued fine efforts in maintaining and furthering of our profession of arms.

THOMAS J. MACHAMER
Captain, Infantry
Hammond, La.

A Different View of Red Thrust

Dear Sir:

The article "Red Thrust" in the September-October issue of ***ARMOR*** gave a lively description of an active defense exercise conducted at Fort Irwin, Calif. This type of exercise is the best way to bring home basic platoon and company tactics. I'm sure that current and future students of the Armor Officers Advanced Course will have read the article which will ease my task of bringing this battle "alive" during tactical discussions.

However, I believe that some of the lessons which Captain Raymond drew out of the exercise are false, in particular: "When the enemy closes to within 1,500 meters of your position you had better begin to move."

First, I think the author will readily admit that each tactical situaton is unique due to the terrain, so that the trigger point could be as far as over 2,000 meters or as close as around 1,000 meters. It is wrong to give the impression that at a specific range the platoon should get-up and go. Indeed, using a trigger point to initiate movement to another battle position is, in my view, so difficult to manage in battle that other criteria for movement should be used. Secondly, readers of the article must have noticed the problem of matching this to another lesson namely: "Make every round count, shoot to kill, and shoot at long ranges."

In considering tanks, the range at which you begin to make more than 50 percent of rounds count is 1,500 m (refer to FM 100-5 page 2-5 and GTA 71-1-1). So that by firing at targets beyond 1,500 meters, you are likely to waste more than half your ammunition at the cost of giving away what may be some of your better defensive positions.

Captain Raymond did not reveal how successful the 19 platoons were at knocking out the armored vehicles and how many rounds each tank had fired in the process. I wonder whether those platoons who failed to move before becoming decisively engaged knocked out more tanks than those who moved when the threat was 1,500 meters distant.

In deciding when to disengage, the precise role of the platoon must be defined. The purpose of some positions may be for sniping at the first tank (roller or plough) to appear at, say, 2,500 meters. This assumes that there are no other weapon systems that can better cover the task (i.e., TOW) and that replenishment ammunition is available at the next position. In this case disengagement will take place immediately following a successful engagement.

The more common platoon position will require maximum possible destruction of the enemy. The tank platoon is most effective at battle ranges between 1,500 and 500 meters (and closer). This means that the platoon must defeat the 1st echelon of an attack before thinking about moving. There is no reason why it should not be able to do this from well-planned and prepared defensive positions, which include alternative firing position for each tank. At some time, there will be a pause while the 2d echelon is directed at the position. This is the time for the company commander to decide whether he remains at sufficient strength to halt a further wave or whether it is time to regroup in another battle position.

Leaving aside the question of the effectiveness of tanks at ranges beyond 1,500 meters, it must be remembered that on the majority of occasions, visibility, for one reason or another, will be restricted to about 1,500 meters.

Thus, I personally conclude that tanks are more likely to achieve the aim of halting an attack by planning to do so at about 1,500 meters. Once battle is joined at this range there is no question of moving to another battle position until that enemy unit directly to the front has been halted or its surviving elements have scattered, by which time they are no longer a viable force.

R. G. OLIVER
Major, Royal Tank Regt.
British Exchange Officer
USAARMC

A Profession

Dear Sir:

I think Captain Mixon is taking too much for granted when attempting to generalize for the feelings of all junior officers, especially in the face of the fact that my advanced class was informed by General Rogers, then Army Chief of Staff, that junior officer resignations set an all-time high last year. Apparently, there is dissatisfaction about something.

Having read CPT Mixon's editorial in the November-December ***ARMOR,*** I find I can only agree with him in the last paragraph of his editorial where he states he is profoundly affected. The Army is a profession not a mission.

STEPHEN G. WHITWORTH
Captain, Armor
U.S. Army ROTC
Ball State University

He Was a Great Man

Dear Sir:

I came to Fort Knox in February 1940 to organize and command the first armored engineer unit, the 47th Engineer Mechanized Troop. I later was Division Engineer of the 1st Armored Division and 4th Armored Division, and I was at Knox when the Armored Force was formed and when General Devers came. I served under General Devers in the plans division of Armor Ground Forces and as his G3.

He sent me to be assistant commandant of the Armored School in 1948. I was a member of the board that developed the first armored division TO&E. I was always very close to General Devers.

Two items you overlooked:

General Devers had recommended that Artillery go to a 6-gun battery while an instructor at the Field Artillery School. The Chief of the Field Artillery turned it down. General Devers ordered it in the armored forces as one of the first things he did. Later the whole Army followed.

When General Devers came to Fort Knox, in 1941, there was no tank in production for the armored force. He went to Detroit and assembled the tops of General Motors, Ford, and Chrysler in his hotel room and told them they could go when they agreed to pool their efforts to produce a tank for WW II. The *M-4* resulted at a cost of about $40,000. There were thousands produced quickly. Compare that with the *XM-1* which grew from a proposed new tank in 1960. Nineteen years later we do not have a new tank in any numbers and the cost is over a million each.

There are other things about General Devers in "Clarke at St. Vith."

He was a great man.

BRUCE C. CLARKE
General, USA (Ret)

Some New Equipment

Dear Sir:

The withdrawal of the *M-551* from service leaves the Army with 1500 chassis which cound be put to practical use. By installing a twin or quad turret with 25-mm cannons, our ground forces could have a credible air defense vehicle. While the proposed DIVAD will provide the weight of fire, a quad-25 could provide the volume.

The Army and Marines should adopt the AAI Corporation's light tank with a 75-mm KE, autoload-cannon as the *M-551* replacement. This 16-ton light tank could replace the *M-60/M-48*-series tanks in the cavalry and light infantry divisions which will most probably make up the proposed quick reaction force.

Let me propose some modifications to the *M-113* fleet. By moving the commander's hatch behind the driver, we can install a gun turret to the commander's right behind the engine compartment. Also, by cutting out part of the hull at the squad stations and replacing it with 45-degree sloped armor plate with vision blocks and gun ports we could convert *M-113s* into combat fighting vehicles. A buoyancy cell would have to be added on the trim vane to compensate for the added weight of the turret. Additional flotation cells would also be added along the sides of the APC to act as spaced armor and to increase the freeboard.

Thank you for letting me air my thoughts.

DAVID M. REITHMEIER
Rochester, MI

THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commanding General
U.S. Army Armor Center
and Fort Knox

We have a tendency to express tactical doctrine in overly complicated terms. That is a situation that must be corrected. Everyone in the combat arms and combat service support units must understand that offensive operations are essential to success in war. Furthermore, we must understand that such operations must be simple in concept and capable of being quickly and forcefully executed.

Defensive operations may win battles, but offensive operations win wars. Granted, the active defense will probably be the first course of action in a war in Central Europe; nevertheless, the success of the active defense depends on effective offensive actions and those actions will be a part of the "first battle."

> *"The defending commander thus directs the fight by specifying which battle position his units will occupy and what they will do there—defend, support, attack."* FM 100-5, *Operations.*

We must act now to reinforce the conviction that our best bet for winning the battles and the war is to initiate offensive actions boldly and conduct them aggressively whenever and wherever we have the opportunity to do so. Furthermore, we must convey this conviction to our officers, noncommissioned officers, and soldiers through realistic training and the dissemination of an uncomplicated, understandable "how-to-fight" philosophy.

To do this, we must understand the essentials of offensive operations, their purpose, and the nature of the battlefield on which they will take place.

The purpose of offensive operations of all units, regardless of size, is to neutralize or destroy the enemy's firepower so that he can no longer conduct tactical operations. The combined arms team does this through speed and maneuver, forcing the enemy to fight on our terms—terms that permit us to capitalize on the open-mindedness, innovative ability, and initiative of our leaders when the opportunity for success arises.

> *"If you will permit me to be a little critical I have generally found that American tactical and operational command tends to follow a rigid pattern, a school situation."* Lieutenant General Heinz Gaedcke, former commander, German Third Corps, Koblenz.

The battlefield on which we attack or defend will not be similar to the one that is sometimes portrayed on situation maps in a headquarters, for service school problems, or in the control scheme of a field training exercise. It will be an integrated nonlinear battlefield

where the intensity of battle varies from unit to unit, and where some units are fighting in isolation while others move to plug gaps or exploit an enemy weakness. Maneuver forces may be defending or delaying, some may be positioned to entrap the enemy and some will become decisively engaged. Brigades will commit some combat elements to counterattack or to attack to exploit an unexpected opportunity. Additionally, it may be necessary to commit task forces to relieve isolated combat elements or support units that are in trouble. This means that in the active defense forces are moving and attacking as well as defending—creating a battlefield in motion instead of a "set piece" engagement.

There is a compelling need for cohesion to the fluidity envisioned for the modern battlefield and it is our job to insure that cohesion by preventing the useless churning of units in meaningless movement. We maneuver and attack when it creates a tactical advantage. We further insure cohesion by applying those qualities of open-mindedness, innovative ability, and initiative that are the stock-in-trade of mounted combat. By coordinating these elements through a sound approach to command and control and emphasizing speed and maneuver we will be able to conduct offensive operations at every opportunity—this is the real payoff in mobile warfare.

That is why we are about the business of acquiring the *XM-1* tank; *XM-2/3* infantry/cavalry fighting vehicles; an improved command, control, and communication capability; better combat aviation resources; and improved intelligence acquisition assets. They are the tools for those with initiative and are built first and foremost with offensive warfare in mind. And, although their impact on tactics may not be revolutionary, they will have a remarkable influence on the way we think and the way we see the battlefield.

The integration of this new, and often highly-sophisticated, hardware into the force will be a monumental task. However, there are some things that can be done now to prepare for that contingency.

We must put a premium on initiative and eliminate requirements which stifle it and deny or detract from our ground commander's capability to concentrate on and exercise command during the battle.

The strength of our army lies in the decentralization of responsibility and authority of the commander on the ground. FM 100-5, *Operations.*

Reporting requirements are at the top of the list of things that can stifle initiative. Unnecessary reports interrupt the commander's concentration on the fight and have the potential for causing him to miss an opportunity that could be crucial to success. Furthermore, unnecessary after-action reports may be damaging by squandering valuable time that is needed to reequip, perform maintenance, repair and recover vehicles, and in some instances reorganize and retrain. Therefore, we must:

Examine division standing operation procedures and eliminate requirements for non-essential reports. That is a task that is easier stated than done because staff officers seem to have a particular skill for justifying every reporting requirement that their sections generate. Consequently, we must have staffs at all levels become proficient at monitoring command nets and constructing the situation from what they hear on the air or read on the teletype—permitting them to ask for reports only when there is absolutely no other way of obtaining essential information. To that end, command, control, and communication facilities must habitually move or locate so that they can monitor subordinate elements rather than requiring fighting units to adjust locations so they can render reports.

Additionally, we must insist that commanders are forward in their fighting vehicles where they can see and command more effectively. This accomplishes three things—it causes them to lead by personal example, puts them in a better position to see the battle, and enables them to take the initiative.

"Let's stamp out the Personnel Daily Summary Report." General Robert M. Shoemaker, FORSCOM Commander.

Reducing reporting requirements will produce yet another benefit, it will deprive senior commanders and their staffs of the temptation to engage in micromanagement of battles being fought by task force, company, and platoon commanders—the leaders who are in the best position to personally influence the action.

Before the fight begins, brigade and task force commanders must define and agree to the latitude that will be permitted for task force and company commanders to counterattack, recover lost positions, and conduct a pursuit or other special action on their own initiative without asking for permission to do so.

Let's stress initiative in combat service support during combat and convert it to a *push* rather than a demand or *pull* system—an action that in itself will help reduce reports. S4s, G4s, and DISCOM commanders have to push supplies forward without waiting for requests. True, they won't always be right, but at least supplies will get forward. Ammunition, fuel, and water consumption will be high and these items must be pushed forward and the vehicles carrying them must be used to evacuate casualties. In offensive operations in particular, we should be able to push predetermined loads of the critical classes of supplies.

Finally, we must enhance our offensive capabilities by permitting our units to maneuver during FTXs. This can be done by creating scenarios, time schedules, and control plans that encourage commanders to apply initiative and use maneuver rather than frustrating them with a lockstep, checklist type of operation.

These are but a few of the commonsense actions that we can take now to foster initiative and improve our ability to conduct the offensive operations that will be the tie breaker in the next war. Let's get on with it.

Forge the Thunderbolt!!!

MASTER GUNNER'S CORNER

MILPERCEN to Control Assignments to Course

Master Gunner Courses

MILPERCEN assumed control of assigning soldiers to the Master Gunner Course at Ft. Knox, Ky. effective 1 October 1979. Soldiers who meet the prerequisites to attend the Master Gunner Course now can go TDY enroute to their next assignment.

A candidate for the Master Gunner Course must:

- Be a volunteer.
- Be recommended by his Unit Commander.
- Be in grade E6, 7, or 8.
- Have a minimum of 2 years experience as a tank commander.
- Have qualified on Tank Table VIII within the past 2 years.
- Be retainable in his unit for 2 years after completing the course.

Soldiers who are interested in volunteering for Master Gunner School should initiate a request for schooling in accordance with procedures 3-10, DA PAM 600-8. For those soldiers desiring attendance in conjunction with a PCS, the request should be forwarded through channels to:

Commander, MILPERCEN
ATTN: DAPC-EPK-I
2461 Eisenhower Avenue
Alexandria, VA 22331

For those soldiers desiring attendance in a TDY and return status, the request should be forwarded through the local Post G-3/DPTSEC to:

Commander, MILPERCEN
ATTN: DAPC-EPT-F
2461 Eisenhower Avenue
Alexandria, VA 22331

Branch clearance remains a prerequisite to attend the Master Gunner Course and will be granted to those qualified soldiers who apply for the Master Gunner Course in accordance with above procedures. POC is Sergeant First Class James B. Ayres, Jr., Armor Career Advisor. AUTOVON 221-8071/2.

USA ARMOR CENTER

TENTATIVE AGENDA

1980 ARMOR CONFERENCE

TRAINING THE ARMOR FORCE

13-15 May, 1980

Tuesday, 13 May 1980

0900-2400	Registration, Brick Mess Officers' Club, Visit Patton Museum (hours—0900-1630)
1730-1900	Garden Party, Quarters 1
1930-2230	Buffet—Brick Mess

Wednesday, 14 May 1980

0800-0810	Opening Remarks
0810-0900	Keynote Address, "Training the Armor Force"
0900-0930	Recruiting the Armor Soldier
0930-1000	Break
1000-1030	NCO Training
1030-1100	RETO (Review of Education and Training for Officers)
1100-1130	Marine Corps Armor Training
1130-1300	Lunch
1300-1330	XM-1 Update
1330-1400	M-60A3 Update
1400-1430	Break
1430-1500	XM-2/3 Update
1500-1530	AAH Update
1530-1615	National Training Center Update
1615-1630	Discussion and CG Summary
1830	Cocktails and Banquet (dress: coat and tie)

Thursday, 15 May 1980

0800-0845	Armor Training Strategies for the 1980's
0845-0930	Combat Aviation Training Strategy for the 1980's
0930-1015	USAREUR Training Strategies for the 1980's
1015-1045	Break
1045-1130	Armor Association General Membership Meeting
1130-1300	Lunch
1300-1345	Armor Training Devices Overview
1345-1630*	Exhibits, Displays, Demonstrations, and Visits with USAARMC Agencies as desired

*Demonstrations of Training Devices will be scheduled Thursday p.m. if sufficient armor-related vendors respond. Otherwise, conferees are free to tour and visit USAARMC agencies as desired.

1776 1917

Covering Force Operations

by Colonel Robert E. Wagner

There is no substitute for field training exercises (FTXs) in preparing the covering force for war. Only full-scale FTXs can resolve the problems inherent in covering force operations and produce the familiarity with the ground, the weapons, and the plans which is the precondition for victory.

The foregoing statement is one of the primary conclusions drawn by the commander and staff of the 2d Armored Cavalry Regiment (ACR) following the regiment's participation in Exercise CERTAIN SENTINEL in early 1979.

During the covering force phase of the exercise, the 2d ACR successfully covered a 90-kilometer sector for over 2 days and nights against the attack of a reinforced armored division; thereby demonstrating the feasibility of the covering force missions established by FM 100-5, *Operations.* Those missions are to:

- Deceive the enemy as to the location of the forward edge of the battle area (FEBA).
- Divest the attacker of his accompanying air defense.
- Gain time for the main body.

The exercise, which was conducted in the Steigerwald and Main River Plain (figure 1) during a typical Northern Bavaria winter, produced the following major lessons in cavalry operations.

There must be an overall concept governing the course of the covering force battle. Here the definition of the active defense must be clarified. In the 2d Dragoons it is fought according to the following battle concept. The battlefield must be structured through fires, barriers, and maneuver to permit combat operations on the enemy's flanks and in his rear areas where the ratio of combat power is in our favor and a victory can be achieved. In essence, active defense is seen as an offensive operation which incorporates not only the movement of uncommitted forces to the nose of the penetration to meet the enemy's strength, but also to hit the enemy where he is weakest and win.

Cavalry regiments are uniquely suited for covering force operations. Cavalry units offer a real economy-of-force for divisions and corps, and their special training, high densities of communication and surveillance equipment, and a highly-mobile combined arms mix which can only be described as cavalry *panache* make them far more effective than other units for covering force fighting.

The main battle area (MBA) and covering force area (CFA) battles are inextricably linked. The general combat worthiness and deployment state of the MBA forces dictate the nature of the covering force battle. If the MBA forces are not fully deployed, lack training, or have poor communications, they will compel the covering force commander to fight conservatively to gain time for the MBA forces. To do otherwise could jeopardize the corps position.

The converse is also true. Well-prepared and equiped MBA forces allow the covering force to fight aggressively and become and extension of the MBA active defense. The two forces acting together and properly employed represent a considerable force multiplier.

The covering force must be adequately reinforced with supporting arms. Tactical close air support and artillery increase firepower and interdiction. Air cavalry is employed in the critical combat tasks of economy-of-force, surveillance, and rapid reaction. Air defense artillery is essential because the covering force will initially bear the brunt of enemy air attacks. Barriers are needed to sturcture the battlefield and magnify the effect of the maneuver forces by impeding enemy movement, protecting flanks, and forming the pivots for maneuvers of uncommitted forces.

Additionally, infantry and tank companies should be added to occupy difficult terrain and serve as strike forces. Equally important is the need for these diverse reinforcing elements to train together before the battle. If the force doesn't have this opportunity, reinforcements can become an operational liability rather than an asset.

The enemy at the start of the battle will enjoy the political and tactical initiative. When combat begins along an inviolate border, the covering force commander can be hobbled by reservation of authority for specific types of reaction by higher levels of command. The time required to obtain authority

for these responses can seriously degrade their effectivness. True, a bridge blown too soon could start a war, but one blown too late could also lose one.

The border itself is a problem as long as it remains a restriction on covering force operations because it allows the enemy to maneuver in politically protected areas while he feints and thrusts at the CFA. Even so, the covering force must seize the initiative. If it doesn't, the covering force must fight a linear-type defense against a larger force where attrition and erosion of combat power will be inevitable. To seize the initiative, the battlefield must be structured as described earlier.

Battle success depends on timely combat information reporting and immediate tactical reaction to the reporting. Dangerous threats must be identified quickly in an atmosphere filled with distractions and the background noise of minor contacts. Reaction to these threats must be immediate and violent. Cavalry reaction time translates to execution upon receipt of orders. Anything slower courts disaster.

Reliable command and control systems are essential to covering force success. Controlling 10 subordinate units in the CFA taxed the communications capability of the 2d Cavalry to the limit, even though a preexercise reconnaissance was made. Better communication equipment is sorely needed.

In addition to the major points discussed above, numerous other important lessons surfaced during the exercise. These are grouped under the broad headings of political considerations and military constraints, tactics, and logistics, and are discussed in that order.

The covering force's ability to provide warning and reaction time to the MBA can be seriously degraded by political considerations that may dictate great military restraint in border areas during periods of tension. However, political and military planners must balance this restraint against the cost it imposes on covering force effectiveness. Emplacing obstacles takes time and must be started as early as possible. Rules of engagement must permit the commander to react quickly and forcefully to enemy attacks. Otherwise the covering force may not succeed in forcing the enemy to disclose the direction of his main attack or provide the main battle force time to deploy.

Permission to destroy bridges, lay mines, and block highways will be slow in coming because of the political and moral impact of such actions. Therefore, division and corps commanders should balance these considerations against the demands of readiness and grant their covering forces permission to execute forward obstacles as early as possible.

Tactical lessons which surfaced during the covering force phase of Exercise CERTAIN SENTINEL pertain to such areas as combat surveillance, reporting, air cavalry employment, task force organization, artillery support, barrier systems, long-range intelligence collection, and handing off enemy forces to MBA units.

Covering forces must maintain surveillance across their entire sectors even while dealing with major attacks. This requirement prevents a covering force commander from concentrating solely on committed enemy forces and ties up a considerable part of his forces. Regardless of the fact that he can turn over sectors to air cavalry, ground scouts, or even to a picket line of radar sites, the covering force commander must remain informed about his whole sector even while he concentrates against major threats.

Reporting is as important as fighting in the CFA. Covering force units must train to fight and report simultaneously. Every level of command must be aware of the importance of reporting and special attention must be devoted to maintaining reliable communication. Additionally, intelligence officers in covering force units must be as active

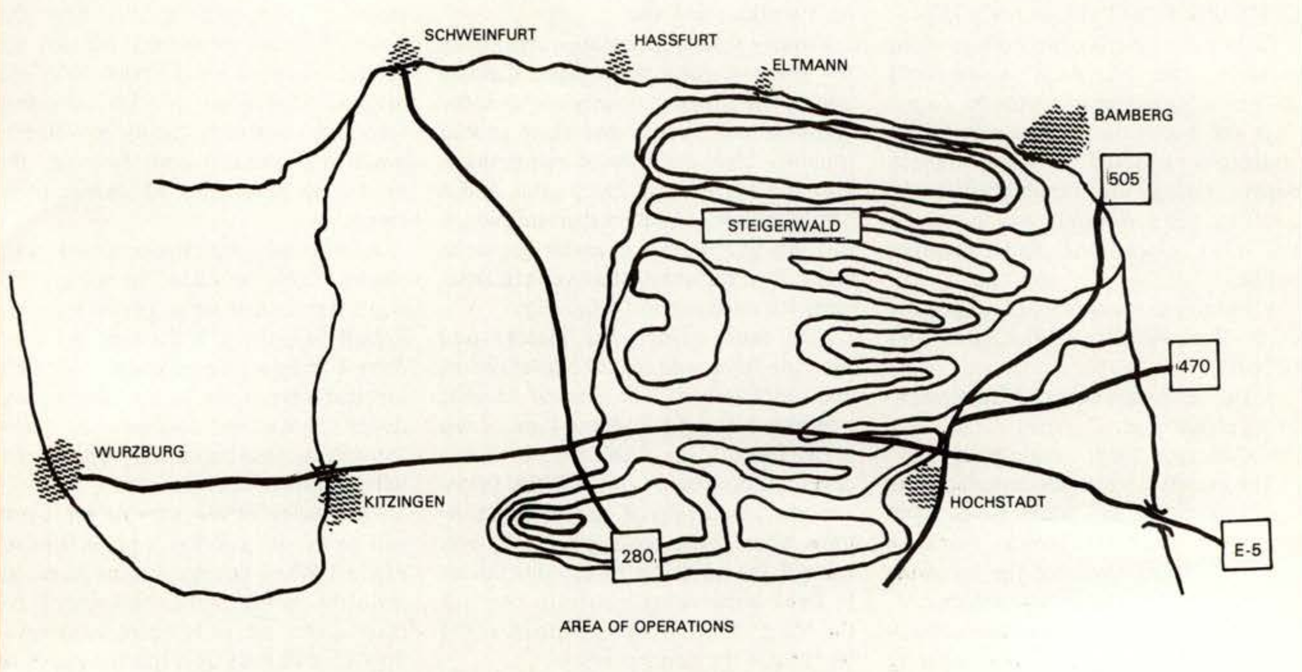


Figure 1

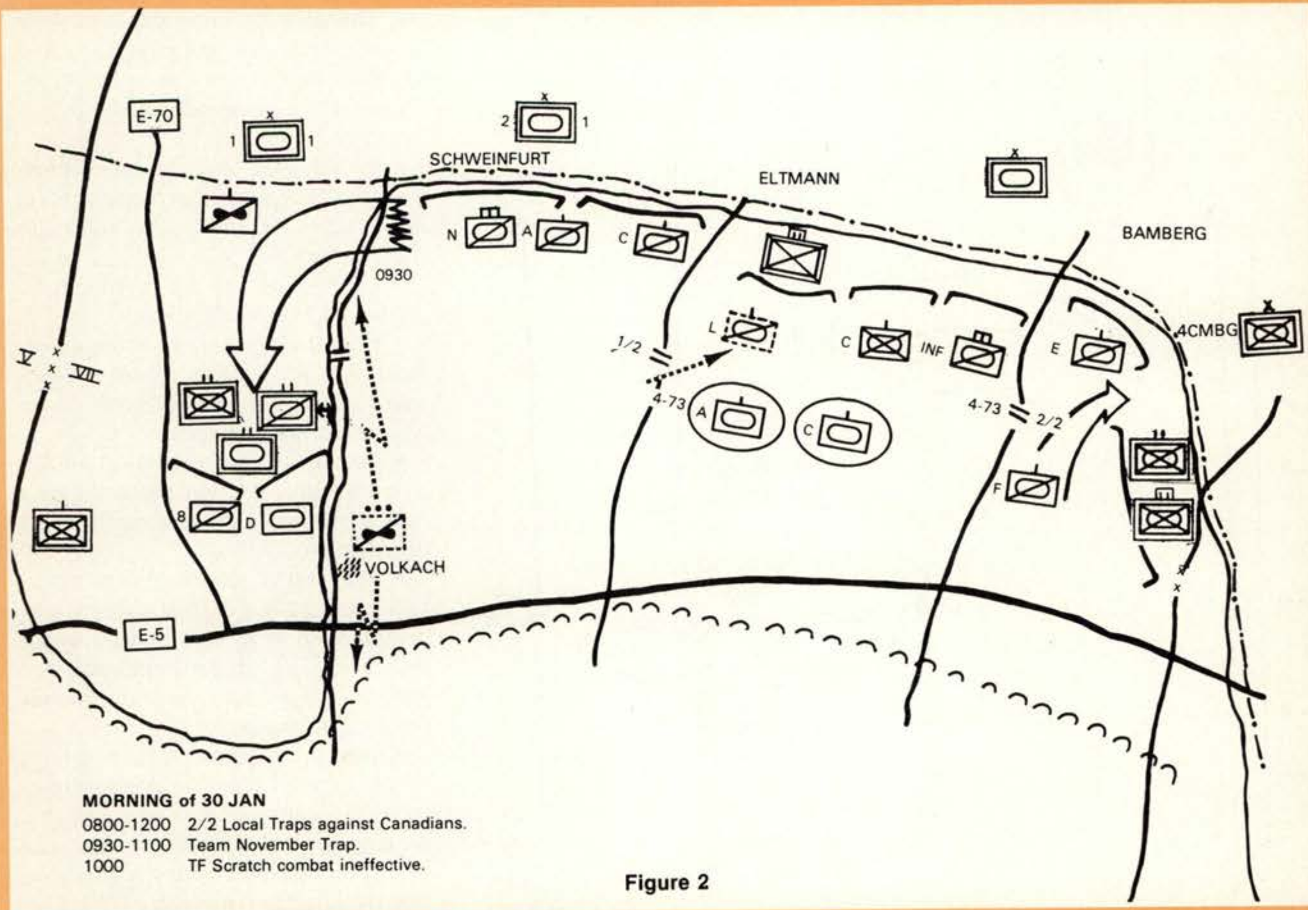


Figure 2

and demanding as operations officers.

Air cavalry adds vastly to the covering force's ability to fight and report, especially aeroscouts in a general surveillance role on screen lines (figure 2). Their capability to collect information at night, using image intensification devices, exceeds expectations spectacularly and opens a new field for development in future training.

Attack helicopters, with their 30:1 ratio of tank kills, are the fastest, most potent reserve available in the CFA. In CERTAIN SENTINEL, the attack troop, working with their scouts, took over a squadron-sized sector without the support of ground units on the first day of combat.

Air cavalry also increased the covering force's combat power significantly through the employment of the *M-56* aerial mine dispensing system. This capability to lay mines in front of an attacker as his attack develops or to secure friendly flanks with mines on short notice adds a new dimension to combat operations. As an extension of this type of mine warfare, the potential of shell- or rocket-delivered scatterable mines is great.

All told, the air cavalry troops of an armored cavalry regiment are considered to be worth a battalion of ground maneuver troops and favorable flying conditions improve the efficiency of a regimental covering force by 50 percent.

In another tactical area, the two-troop task force emerged as a distinctive and effective feature of the 2d ACR's offensive operations. Larger forces may be available at times, but generally a covering force will use these *ad hoc* "light squadrons" to exploit fleeting enemy weaknesses. Since many of these opportunities will be unanticipated, all maneuver units must be prepared for quick detachment from their squadrons, and squadron COs, XOs, and S3s must be prepared to command the two-troop strike forces.

The usual time between alert and detachment was 2 hours and the forces never existed for more than 8 hours. No special logistical support was provided to the "light squadrons," but they always required dedicated air and artillery support.

As to artillery support for covering force operations, it was learned that this vital element of combat power is not adequately covered by current doctrine. When a direct support (DS) artillery battalion is available for each committed squadron, the covering force can mass fire adequately and be able to deceive the enemy as to the location of the FEBA. When less artillery is available, the command and control of indirect fire is complicated and effective fire is hard to obtain. Control of all covering force fires by a single battalion is not satisfactory. Each squadron requires dedicated, responsive, and fairly heavy artillery support. When DS battalions are not available, the best solution appears to be reinforcement of the squadron's organic battery with one or more batteries from the supporting artillery force. This reinforcement gives each squadron a reasonable amount of artillery that can be moved by the commander to support his fight.

Barrier systems give the battlefield its structure, and permit the covering force to operate against the enemy's vulnerable areas where the ratio of combat power is in our favor. These barriers are pivotal elements of the combat power equation. The engineer assets for constructing them should not be piecemealed throughout the CFA, but employed in concert with the established battle concept. Properly used, engineer

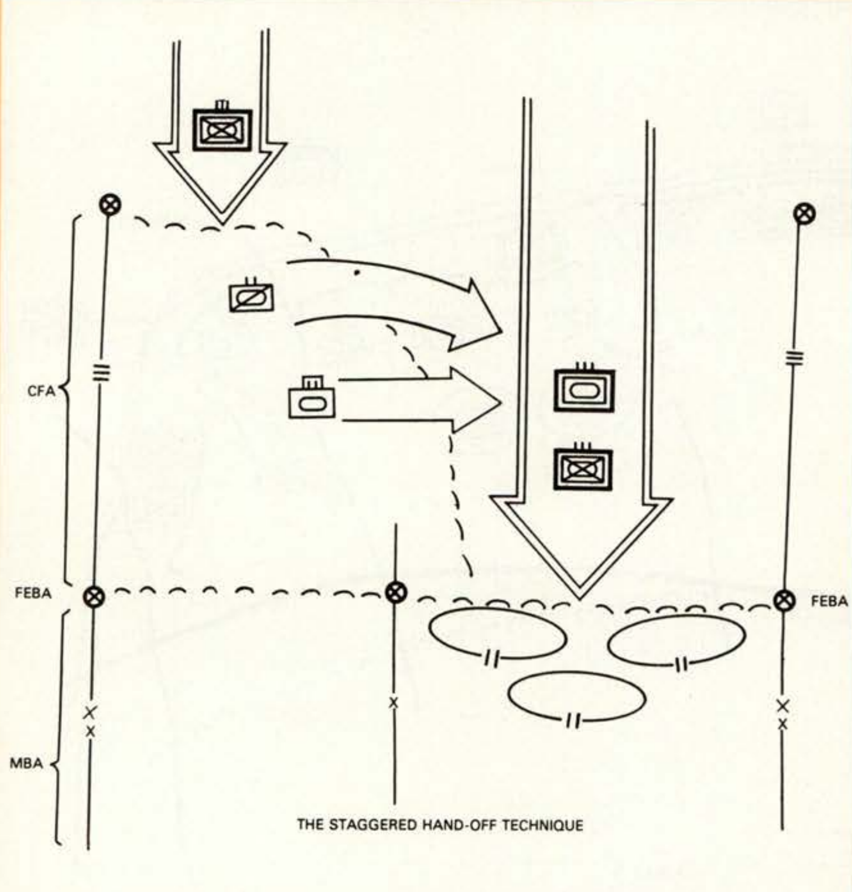


Figure 3

• The covering force area should be as broad as possible and should be under a single commander for cohesive reporting of the battle and coordination of maneuver.

• Breaking the covering force area into brigade-controlled covering force areas undermines the division's ability to resist in the CFA.

• Current doctrine for covering force operations is basically viable.

• Longer-range, secure radio equipment and an organic service support squadron are the greatest needs of the armored cavalry regiment.

• Successful accomplishment of the covering force mission demands great care in planning and complete flexibility in execution.

• The level of coordination necessary to success in the mission can only be developed in joint field training of the maneuver, fire support, engineer, and service support units of the covering force battle groups.

Finally, the statement at the beginning of this article cannot be overemphasized. *War games and CPXs have a place in the development of plans, but there is no substitute for field training in preparing the covering force for war.*

assets enable the commander to mass his forces in more dangerous areas and create additional opportunities for destruction of enemy forces.

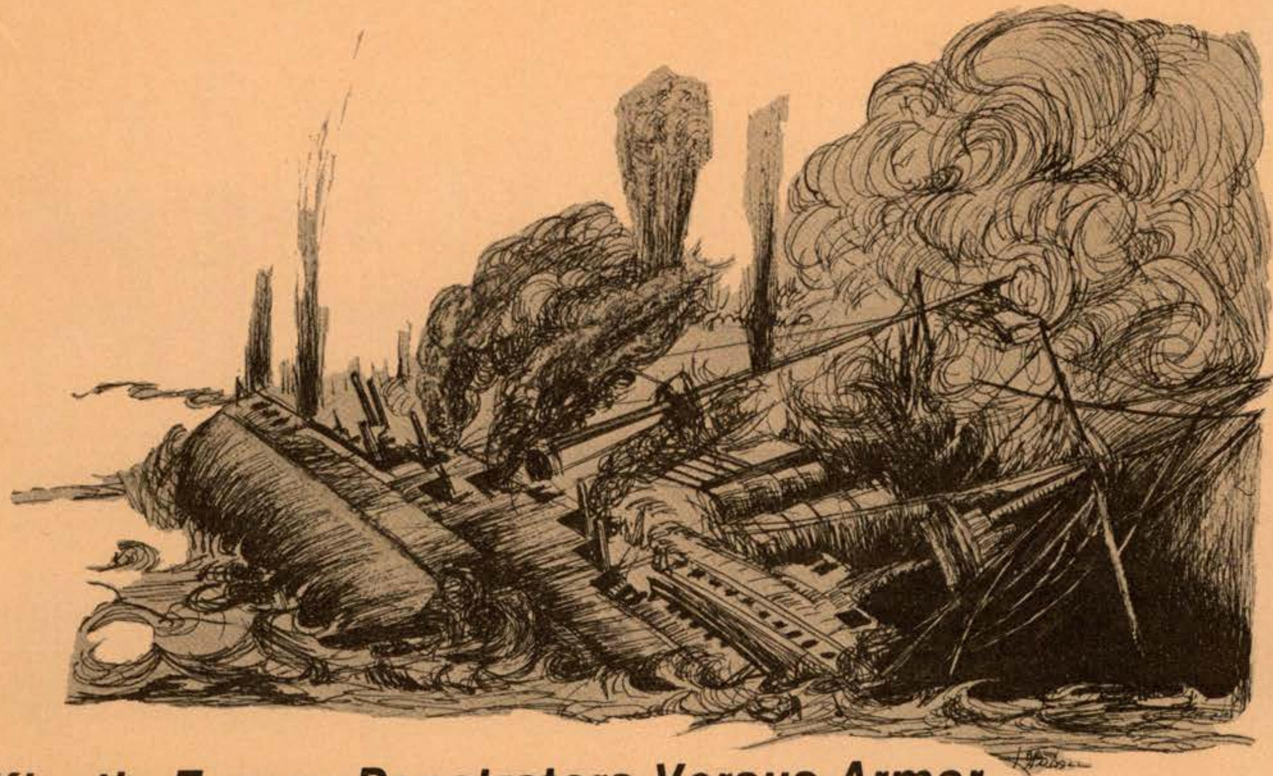
A somewhat surprising lesson from CERTAIN SENTINEL involved the long-range collection assets which are vital to the active defense. Apparently, the assumptions of current doctrine attribute greater effectiveness to electronic intelligence (ELINT) and signal intelligence (SIGINT) than that which was demonstrated during the exercise. In practice, the CFA and MBA commanders had to rely nearly exclusively on reports from the line of contact for information about the enemy. Inability to see beyond the frontline made tracking of the enemy reserve impossible. In one instance, the enemy moved a brigade 20 kilometers laterally, crossed a river, and attacked without being detected by corps collection assets.

A tactical innovation for handing off the enemy to MBA forces was developed and used effectively by the 2d ACR during the exercise (figure 3). Rather than withdrawing on line everywhere in sector, the regiment handed off controllable avenues to the FEBA force and concentrated its efforts elsewhere, thus extending the active defense farther to the front and concentrating combat power on the main enemy effort. This "staggered handoff" technique has the advantages of strengthening the covering force through reduction of its frontage, throwing the enemy off stride by disrupting the timing of his attacks, and allowing the MBA force to deal with major threats separately. The staggered handoff will also create opportunities for flank attacks into the enemy force.

Logistically, the single and most critical lesson from the 2d ACR's experience on CERTAIN SENTINEL was that the ACR needs a service support squadron with enough maintenance, supply, administrative, transportation, and medical capability to support extended independent operations. As it is presently supported, the large, armor-heavy cavalry regiment is an unnecessarily fragile juggernaut.

Additional observations and conclusions derived from the 2d ACR's participation in CERTAIN SENTINEL follow:

COLONEL ROBERT E. WAGNER is a graduate of the Virginia Military Institute and the National War College and has earned an MA degree from George Washington University. His assignments include command of an armor battalion, cavalry squadron, and, with the British Army of the Rhine, a Squadron of Royal Hussars (Queen Mary's Own). In Vietnam he served as both a sub-sector and province senior advisor. COL Wagner has also served in a variety of staff positions, including a tour with the NATO Policy Branch, J-5, Joint Staff and most recently as the Chief of Staff, 8th Infantry Division. COL Wagner currently commands the 2d Armored Cavalry Regiment.



Kinetic Energy Penetrators Versus Armor

by Joseph E. Backofen, Jr.

This is the second in a series of articles on tanks and the technologies of armor penetration, armor, and survivability.

Modern ground armies are characterized and described by their forms of armored equipment, such as tanks, mechanized infantry combat vehicles, and self-propelled guns.[1,2] The primary purpose of armor on these mobile weapons systems is to protect the most important element, the soldier.[3]

Kinetic energy (KE) projectiles have historically been and still remain a primary means of perforating an enemy's armor envelope and destroying the protected systems and personnel. They achieve this principally through perforation of the armor by a penetrator (the core or main body of the projectile). However, KE projectiles may also use materials that generate a behind-armor effect, such as fragmentation (penetrator and/or armor), blasts, or incendiary effects. Since the KE penetrator relies on high-velocity impact to defeat armor, the high-velocity yields a flat trajectory, decreased time of flight, and increased hit probability.[4] The total ballistic performance yields a time-to-kill advantage over guided missiles and other ammunition utilizing shaped charge warheads within the anticipated engagement zones of battlefields dense with enemy armor, mobile targets, and terrain obstacles from which targets are only briefly exposed.[4-8]

Modern KE projectiles for land combat can trace their roots back to armor-piercing shot developed to pierce armored warship envelopes and destroy the personnel and equipment within. The trends began with the use of solid shot against the sides of wooden ships. It was noticed that heavier solid shot (large diameter) could penetrate better and make larger holes at longer ranges.[9] However, it was also noticed before the 1780's that hollow shot of the same diameter as the heavy solid shot but being lighter could be fired at higher velocities, providing better penetration capability, but only at short ranges.[9] Later Paixhans proposed, before 1822, that the cavity in a shell be filled with explosive so that it could provide both more damage to the armor and behind-the-armor-effects. These developments in the days of the spherical cannonball presaged the similar trend in antitank ammunition that went from solid shot to composite rigid shot as well as the call for follow-through, behind-the-armor-effects research.

The weight and velocity of the shot and shell determined both their effective range for penetration and the effects within the target. These, in turn, heavily influenced the tactics of warship engagement and naval force maneuver in order to avoid attacks where ricochet, obliquity effects on presented thickness, and insufficient kinetic energy for penetration would preclude damage to an enemy (especially if he could still inflict punishment in return).

Antiarmor projectiles, however, owe much more to the development of armor-piercing shot to defeat iron armored warships, Initially, there were two schools of antiarmor thought: those that wanted to "rack" the armor so hard that it opened at its joints and fell apart, and those that wanted to "punch" through the armor to cause damage to the crew and contents of the ship.[9] The former group fell into the trap that still claims the attention of many today: demonstration of expertise in attacking the armor envelope. Penetration/perforation required the use of a heavier shot applied over a given caliber which led to the use of cylindrical shot and rifled guns as a method of increasing the penetrator's length-to-diameter ratio.

In 1864, Palliser developed armor piercing shot on which the nose was chilled in order to harden it so that it could more easily penetrate iron armor.[9] Since the punching of a hole through the armor envelope did little to affect the fighting capability of a warship, the hollow space within the rear of Palliser's round was later filled with gunpowder to become the Palliser shell.[9] Upon impact and penetration of the armor envelopes,

the gunpowder was exploded after about one caliber of penetration or about when it entered into the warship so as to cause increased behind-the-armor-effects.

The response of armor to the trends in shot and shells began with the use of iron as an applique over the laminated wooden structures of the ship.[10] Soon all-iron ships were constructed with the armor forming part of the structure of the vessel. Then with the advent of 12- to 16-inch guns and Palliser shot, warships could not take on the weight required to prevent perforation. This led to the call for either lightly armored warships of high mobility (which have proven disastrous in wars)[10-12] or the development of new armor materials.

The latter response was best answered first by compound armor that consisted of a high-hardness steel facing welded to the front surface of an iron plate. This presented a very hard surface for the hard nose of the Palliser shot to penetrate and the softer iron to absorb the energy of the blow.[9,10] However, this armor had the weakness of not being able to withstand multiple hits. In concept and practice, compound armor had much in common with dual hardness armors later applied to trucks and other vehicles in Vietnam as protection against fragments and small arms projectiles.

Further major increases in armor resistance to penetration came about with the addition of a small percentage of nickel to the steel composition (Schneider & Co. at Creusot) and the face hardening of the plate by carbonizing (Harveyisation process or Krupp Cemented Plate).[9,10]

These had the effect of toughening the basic armor plate while hardening the surface that received the initial impact. The hard outer surface caused the hard nose of the chill-cast Palliser shot to break up much in the same way as the ceramic-faced armors used in helicopter armor in the Vietnam war caused small arms and machinegun projectiles to break up.[13]

Compound armor was first defeated in 1878 by introducing a ductile iron ballistic cap on the nose of the Palliser shot.[9,10] Later, the armor was also defeated by chrome-steel alloy projectiles because their material properties (toughness) meant that the nose was not succeptible to impact shattering like the Palliser shot. Furthermore, impact by these projectiles caused the compound armor to delaminate so that it was easily penetrated by a subsequent shot.[10]

Later, during the competition between face-hardened steel armor and steel armor-piercing shells, the Russian Admiral

Makarov reinvented the ballistic cap in 1893 to assist in penetration by applying radial pressure to the point of the shell so that the steel shells would not break up.[14] However, the cap was effective only up to limited angles of attack such as 15 degrees. Beyond 30 degrees, it was esentially useless.[10] Furthermore, it was known that a thin layer of steel separated by an air gap from the main armor (spaced armor) could be used to strip off the cap thereby destroying the effectiveness of the shell.[14]

The angle of obliquity at projectile impact against ship armor was principally dependent upon the range and azimuth from which the ship was attacked. It was dependent upon the range because of the orientation of the spinning shell with respect to its trajectory. With long range, it was possible to obtain "plunging" fire which could theoretically go through the thinner deck (top) armor. However, the probability of being able to obtain a hit at long range against a moving maneuvering target was rather low.

The azimuth obliquity was due to the approach geometry during the encounter. It appears that sloped armor as we know it in tank turrets and hulls was only commonly used in ship turrets and subtly used occasionally in spaced armor arrays built into the side structure of the ship (sometimes stores such as coal were used as fillers within the spaced arrays).[10,11]

The antitank KE projectiles used by Germany, Britian, Russia, and the U.S. before and into World War II were similar (armor-piercing shot and shell) and appear to have been developed from experience with naval armor-piercing projectiles.[15-22] However, just prior to World War II, Germany was also developing both projectiles for taper bore guns and high-velocity, armor-piercing projectiles of the Arrowhead type (composite rigid).[16,17,23] The Arrowhead projectiles were lightweight and therefore could have a higher velocity than the solid shot from the same gun, but lost velocity faster than range (the same principal as hollow cannnonballs). During the war, the Arrowhead projectiles were copied by the Soviets[18,19] and similarly invented/developed by Britian and the U.S. as German tank armor got thicker.[17,21,24]

All of these KE projectiles carried within them a subcaliber penetrator usually made from tungsten carbide so that the kinetic energy could be focused over a very small area by this hard material, and the resulting penetration would be deeper. When Germany was cut off from its supply of tungsten from Portugal in the summer of 1943, the German minister of production released about 1,200 metric tons of uranium for use as high density cores in their AP 40 (Arrowhead projectiles).[25,26]

The uranium cores provided the same armor-piercing capability as the tungsten carbide cores, as well as the presently well-known pyrophoric behind-armor effect.

Table 1 presents typical armor-piercing capabilities of the guns used in various popular tanks. Information on the capability of more modern weapons and tanks is not included because it is generally held as classified information. However, 105-mm APDS-T destroyed numerous Soviet-built tanks during the Mideast wars.[34]

The information in Table 1 is useful in many ways. For example, it has been estimated that KE penetrators account for about 40 percent of tanks which are knocked out.[35]

Also, it is known that the British used mostly homogeneous armor plate, the Germans used face-hardened armor, the Americans used cast armor, and the Russians high-hardness homogeneous and cast armor.[35] The differences in armor protection and armor penetration capabilities between matching tanks can be used with this information to explain why certain battlefield tactics and vehicle modifications appeared.

Before and during World War II, the Soviets appeared to desire and require the capability of perforating an opposing tank's armor at ranges up to 1,000 m.[8,28,29] In contrast, it appears from Table 1 that the Germans desired and achieved the capability of perforating an opposing tank's armor at ranges up to 2,000 m.

During World War II, the Soviets became particularly aware of German capabilities "...heavy tanks and Ferdinands would stop at a distance of 1,500-2,000 m from antitank strongpoints and engage the antitank weapons."[8] It might also explain why the Soviets would close rapidly *en masse* into the German positions when they were attacking tanks (i.e. they were willing to take losses, but were trying to minimize them until they got within 500 m where their weapons became effective).[36] The Soviets have noted that the same standoff attack was also employed by U.S. tanks in the Korean War.[8]

The tank and manpower losses caused by the limited effectivenss of their guns and ammunition may have forced the Soviet development of the 115-mm smoothbore gun and its ammunition between 1952 and 1959 so that it could be used to upgrade the *T-54* type vehicle into the *T-62*. More recently, it has been noted that "...concentrated fire from several *T-62*s firing together knocked out some Israeli tanks at ranges in excess of 2,500 m" and "...115-mm APDS can go through the front turret of a *Centurion* at 3,000 m."[34]

However, the normal depth of a Soviet antitank fire pocket using KE penetrators may still be only 1,300 to 2,000 m depending upon the terrain.[8]

The U.S. response to the situation presented in Table 1 took two forms. First, when engagements occurred between U.S. and German tanks, the U.S. tanks would attempt to break contact and maneuver to attack from the flanks, so that their guns could pierce the German's side armor. Secondly, U.S. troops were forever coming up with different forms of applique armor as field modifications of their insufficiently armored tanks.[32,35,37]

A problem with applique armor arranged by troops in the field is that it can actually degrade the performance of the vehicle's armor. One example is that improper welding can harm the ballistic properties of armor. A second example comes from 1878, when a sheet of ductile iron was left on the front of face-hardened armor and assisted the brittle Palliser shot in perforating the armor (basis of the invention of the ballistic cap). In this light, it should be noted that when the Germans up-armored with applique armor, they did it with spaced armor so that the first plate and air gap would remove the KE projectile's ballistic cap in order that the penetrator could be fractured by the face-hardened armor.[16,38]

Tanks are now facing the development of new guns and armors. In comparison, the development of ship guns and armor were relatively unconstrained. The ship guns and projectiles grew to be 16- and 18- inch caliber before World War II. But tanks are constrained to be able to go through tunnels during transport, by the internal volumes required for gun, crew, and ammunition,

Table 1. Typical frontal armor thickness and normal obliquity armor penetration capabilities of tank-gun-fired kinetic energy penetrators for Soviet, German, British, and U.S. tanks [8,15,16,19,22,27-33]

Vehicle/ Gun (mm)	Frontal Armor Thickness/Obliquity (mm/°) Glacis	Turret	Penetration (mm) at Ranges of: 500m	1000m	1500m	2000m	Ammunition Type
Soviet							
T-34/76	45/60	60	69	61	54	48	AP-T
			92	58	--	--	HVAP-T
T-34/85	45/60	75	111	102	93	85	AP-T
			138	100	--	--	HVAP-T
JSIII/122	110/55	200	143	126	111	97	AP-T
			150	138	128	118	HVAP-T
T-54/100	100/60	210	155	135	117	100	AP-T
			200	180	160	140	HVAPDS
T-62/115	100/60	210	--	300	--	270	HVAP FSDS
German							
T-III F/50	30/9	30/15	63	48	35	--	APC-T
	30/21		90	58	--	--	HVAP
T-III M/50	50 + 20/9	50 + 20/15	75	59	44	--	APC-T
	50/21		116	70	--	--	HVAP
T-IV E/75	30 + 30/10	30/11	54	49	--	--	APC-T
	50/12						
T-IV H/75	80/10	50/11	130	117	101	85	APC-T
	80/12		151	128	110	90	HVAP
Panther/75	80/55	100/10	160	135	114	98	APC-T
Tiger I/88	100/10	100/10	140	122	108	92	APC-T
	100/24		--	--	--	--	HVAP
Tiger II/88	150/50	185/10	205	186	170	154	APC-T
	100/50		270	133	205	175	HVAP
JAGD Tiger/128	150/50	250/15	215*	202*	--	--	APC-T
	100/50						
British							
Crusader I/40	23	40	56	44	34	27	AP-T
Crusader II/57	51	51	100	89	76	65	APC-T
Cromwell/75	76	76	130	117	101	85	AP
			151	128	110	90	HVAP
Churchill/75	80/10	50/11	130	117	101	85	AP
			151	128	110	90	HVAP
M4 Firefly/76.2	71/46	76	165	140	120	105	APC-T
			186*				APDS
Centurion MK-10/105	76/55	152					APDS-T
U.S.							
M-3A1/75	50/30	88/43	76	70	62	57	APC-T
M-4/75	51/46	85/30	95	86	76	69	APC-T
M-4A1/76	51/46	76	124	117	109	102	APC-T
			212	179	152	127	HVAP-T
M-26/90	102	110	155	147	140	132	APC-T
			282	252	222	194	HVAP-T
M-48A2/90	110/60	110/40	155	147	140	132	APC-T
			282	252	222	194	HVAP-T

* at 60° Obliquity.

by the size of the tracks needed to traverse "soft" ground, and by the engine and its fuel supply. These constraints lead to a rather small envelope in which the armor can be arranged, to a maximum weight for the armor, and to limitations on the size of the gun that can be carried. These present the challenges to ballisticians and material scientists.

Since the majority of the tank's targets will be engaged within 3,000 meters,[3] it would appear best to develop a projectile lethal to armor that traverses this distance as quickly as possible so that the beaten zone would simplify the fire control. World War II German APC-T and HVAP-T ammunition achieved the same penetration performance at about 2,400 meters. This could imply that this was their anticipated maximum engagement range with their fire controls. The HVAP-T projectile gave a quicker and more easily aimed kill up to the 2,400 meters limit indicated on the gun sights.[16] From 2,400 meters to 4,000 meters, the APC-T would be used. The German squeezebore projectiles and British discarding-sabot projectiles attempted to maintain the higher kinetic energy of the subcaliber penetrators to longer engagement ranges by streamlining the projectile. The German squeezebore projectile kept all the gun accelerated mass, while the discarding sabot reduced the mass that would be delivered to the target.

The penetration capability of the subcaliber shells is dependent upon the use and length of hard heavy-metal penetrators. Unfortunately, spin-stabilized projectiles cannot have a length-to-diameter ratio much greater than 4:1.[39] Since penetration is mostly influenced by the length of the penetrator, this had led to fin stabilization of the projectile and penetrator length-to-diameter ratios from 10:1 to 20:1. The Soviets were the first to allow this trend toward high-velocity, armor-piercing, fin-stabilized, discarding-sabot (HVAPFSDS) projectiles.[18,19] But the U.S. experimented with HVAPFSDS ammunition in the 1950's, and now it and other nations of the West are developing and fielding this form of ammunition.[40-46]

The new armors specifically designed to defeat shaped charge weapons appear to also offer protection from some KE projectiles.[39,47-51] But the further development of heavy-metal, long-rod

HVAPFSDS projectiles may be able to keep the KE penetrator ahead of advances in armor.[39] This may also be implied from the further development of HVAPFSDS projectiles for 105-mm and 120-mm tank guns of the West as well as the projectile associated with the Soviet *T-72* main battle tank.[52,53]

The flat trajectory and lethality of the new KE projectiles being developed and fielded imply that the tank is going to need to make more use of cover and concealment as substitutes for additional armor. Also, a HVAPFSDS penetrator may have good penetration capability when hitting like an arrow; but this is quickly lost if it hits while yawed with respect to its trajectory. The required yaw perturbation could be caused by placing cover between the gun and the target. With restrictions on size and weight, the tank and its crew should take advantage of all that is available for adaptation on the battlefield, but not necessarily use it as an applique if this would affect the effectiveness of the tank's armor.

While the age-old competition between ballisticians and materials scientists continues from cannonball and wooden armor through HVAPFSDS projectiles and composite armors, military leaders should remember that the principal function of armor is to protect the crew. Armor envelopes have always been perforated by kinetic energy projectiles at some cost in engagement range and tactics. Although the present ranges for target perforation appear to be at the limits dictated by the terrain, history implies that this will not remain static. In general, any changes will favor the holder of ground who uses cover over the attacker closing in order to occupy the same position. Thus, the use of SABOT for the quick kill during the infighting should continue for some years to come.

FOOTNOTES

[1]F. Wiener, *The Armies of the Warsaw Pact Nations,* Second Edition, Carl Uberreuter Publishers, Vienna, 1978.

[2]R. Bonds, editor, *The Soviet War Machine, An Encyclopedia of Russian Military Equipment and Strategy,* Salamander Books, Ltd., Book Sales, Inc., Secauscus, New Jersey, 1977.

[3]J. E. Backofen, Jr., "Tank-A War Machine For Land Combat," *Armor,* Vol. 89, No. 1, January-February 1979, pp 10.

[4]F. Schreier, "The Modern Battle Tank, Part 2: Firepower," *International Defense Review, Special Series—Battle Tanks,* pp. 15-22.

[5]N. Hannig, "Can Western Europe Be Defended By Conventional Means?" *International Defense Review,* Volume 12, No 1, 1977, pp 27-34.

[6]R. M. Ogorkiewicz, "Present State of the Art of Battle Tank Technology," *Military Teknisk Tidskrift,* No. 3, 1976, pp 5-27.

[7]A. Kh. Babadzhanyan, "Tanki i Tankovyya Voyska," *Voyennoye Izdatel'stvo Ministerstva Oborony* SSSR, Moscow, 1970.

[8]G. Biryukov and G. Melnikov, *Antitank Warfare,* Progress Publishers, Moscow, 1973.

[9]I. V. Hogg and J. Batchelor, *Naval Gun,* Blandford Press Ltd., Poole, Dorset, England, 1978.

[10]W. Hovgaard, *Modern History of Warships,* 1920, reprinted by United States Naval Institute, 1971.

[11]A. Preston, et al., *Battleships 1856-1977,* Chartwell Books, Inc., Secaucus, New Jersey, 1977.

[12]B. Fitzsimons, editor, *Warships and Sea Battles of World War I,* Beekman House, division of Crown Publishers, Inc., New York, 1973.

[13]R. F. Rolston, E. Bodine, and J. Dunleavy, "Breakthrough In Armor," *Space/Aeronautics,* July, 1968, pp 55-63.

[14]V. Hythe, editor, *The Naval Annual 1913,* reprint by ARCO Publishing Company, Inc., New York, 1970.

[15]P. Chamberlain and T. Gander, *88 Flak and Pak,* Profile Publications, Ltd., Windsor, Berkshire, England, 1976.

[16]E. J. Hoffschmidt and W. H. Tantum, IV, *German Tank and Antitank in World War II,* WE Inc., Old Grenwich, Connecticut, 1968.

[17]I. V. Hogg, *The Guns: 1939-45,* Ballantine Books, New York, 1976.

[18]L. W. Williams and J. E. Backofen, Jr., "Soviet Kinetic Energy Penetrators," *ARMOR,* November-December, 1978, pp 43-45.

[19]J. E. Backofen, Jr., and L. W. Williams, *Soviet Kinetic Energy Penetrators—Technology/Deployment,* Battelle-Columbus Labortories, Columbus, Ohio, February 5, 1979 (AD BO35 438).

[20]I. I. Zhukov, et al., *Artillery Weapons (Fundamentals and Design),* Mashinostroyeniya, Moscow, 1975.

[21]*Artillery Ammunition, TM 9-1300-203,* Headquarters, Department of the Army, April, 1967.

[22]*Ballistic Data Performance of Ammunition, TM9-1907,* Department of the Army, July, 1948.

[23]Anon., *Armor Piercing Ammunition, Part I—Projectiles for Tapered Bores, Part II—Special Projectiles for Cylindrical Tubes,* Polte, Magdeburg, Germany, about late 1939.

[24]R. M. Ogorkiewicz, *Design and Development of Fighting Vehicles,* Doubleday and Company, Inc., Garden City, New York, 1968.

[25]A. Speer, *Inside The Third Reich,* Avon Books, New York, 1970, pp 304 and 677.

[26]H. Neufeldt, "Hochleistungswaffen mit konischen Rohren fur die Deutsche Wehrmacht in 2. Weltfrieg," *Wehrtechnische Monatschefte,* No. 4, 1967, pp 144-153.

[27]H. W. Jung, "Fire Power and Armor Protection," *Kampftruppen,* No. 5, 1976, pp 171-173, and No. 6, 1976, pp 213-214.

[28]F. M. von Senger and Etterlin, *Kampfpanzer 1916-1966,* J. F. Lehmanns Verlag, Muchen, 1971.

[29]I. G. Andronikow and W. D. Mostowenko, *Die Roten Panzer, Geschichte der Sowjetischen Panzertruppen 1920-1960,* herausegeben von Dr. F. M. von Senger und Etterlin, J. F. Lehmans Verlag, Munchen, 1963.

[30]J. Milsom, *Russian Tanks 1900-1970,* Stackpole Books, Harrisburg, Pennsylvania, 1971.

[31]C. F. Foss, et al., *The Illustrated Encyclopedia of the World's Tanks and Fighting Vehicles,* Chartwell Books, Inc., New York, 1977.

[32]P. Chamberlain and C. Ellis, *British and American Tanks of World War II,* Arco Publishing Company, Inc., New York, 1969.

[33]F. M. von Senger and Etterlin, *Taschenbuch Der Panzer—1969,* J. F. Lehmanns Verlag, Munchen, 1969.

[34]J. Weller, "Middle East Tank Killers," *Journal of the Royal United Services Institute for Defense Studies,* December, 1974, pp 15-22.

[35]K. Macksey, *Tank Facts and Feats,* The Two Continents Publishing Group, Ltd., New York, 1974.

[36]M. J. Miller, Jr., *Red Armor in Combat,* Grenadier Books, Canoga Park, California, 1969.

[37]G. B. Jarrett and R. J. Icks, *Portrait of Power,* A Photo-History of United States Tanks and Self-propelled Artillery, Normount Technical Publications, Forest Grove, Oregon, 1971.

[38]F. M. von Senger und Etterlin, *German Tanks of World War II,* translated by J. Lucas, Galahad Books, New York, 1973.

[39]R. M. Ogorkiewicz, "Tanks and Anti-Tank Weapons," in *Adelphi Papers,* No. 144, "New Conventional Weapons and East-West Security, Part I," *The International Institute for Strategic Studies,* London, England.

[40]R. Meller, "Rheinmetall's 120-mm Smooth-Bore Gun-tank Armament of the Future," *International Defense Review, Special Series—Battle Tanks,* pp 153-158.

[41]R. D. M. Furlong and R. B. Pengelley, "Main Armament for the XM-1 Tank—Storm Over the Selection Process," ibid., pp 159-161.

[42]R. Germerchausen and R. Romer, "Flugelstabilisierte Geschosee," *Wehrtechnik,* No. 2, February, 1976, pp 49-52.

[43]"British Depleted-Uranium Program Announced," *International Defense Review,* Volume 12, No. 3, 1979, pp 317.

[44]P. A. Leonard, "A Bigger Foot Print," *ARMOR,* Volume 87, No. 5, September-October, 1978, pp 11-13.

[45]"Israeli Ammunition for German Army," *International Defense Review,* Volume 12, No. 2, 1979, pp 158.

[46]"Anti-Tank Weapons," *Armies and Weapons,* No. 20, November, 1975, pp 45-54.

[47]"Improved Chieftain for Iran," *International Defense Review, Special Series—Battle Tanks,* pp 96-98.

[48]R. D. M. Furlong, "The XM-1 Tank Program," ibid., pp 61-64.

[49]"XM-1," *Armies and Weapons,* No. 40, December, 1977/February, 1978, pp 55-62.

[50]S. Enander, "Armor Piercing Ammunition," *Arme Nytt,* No. 5, 1975, pp 22-23.

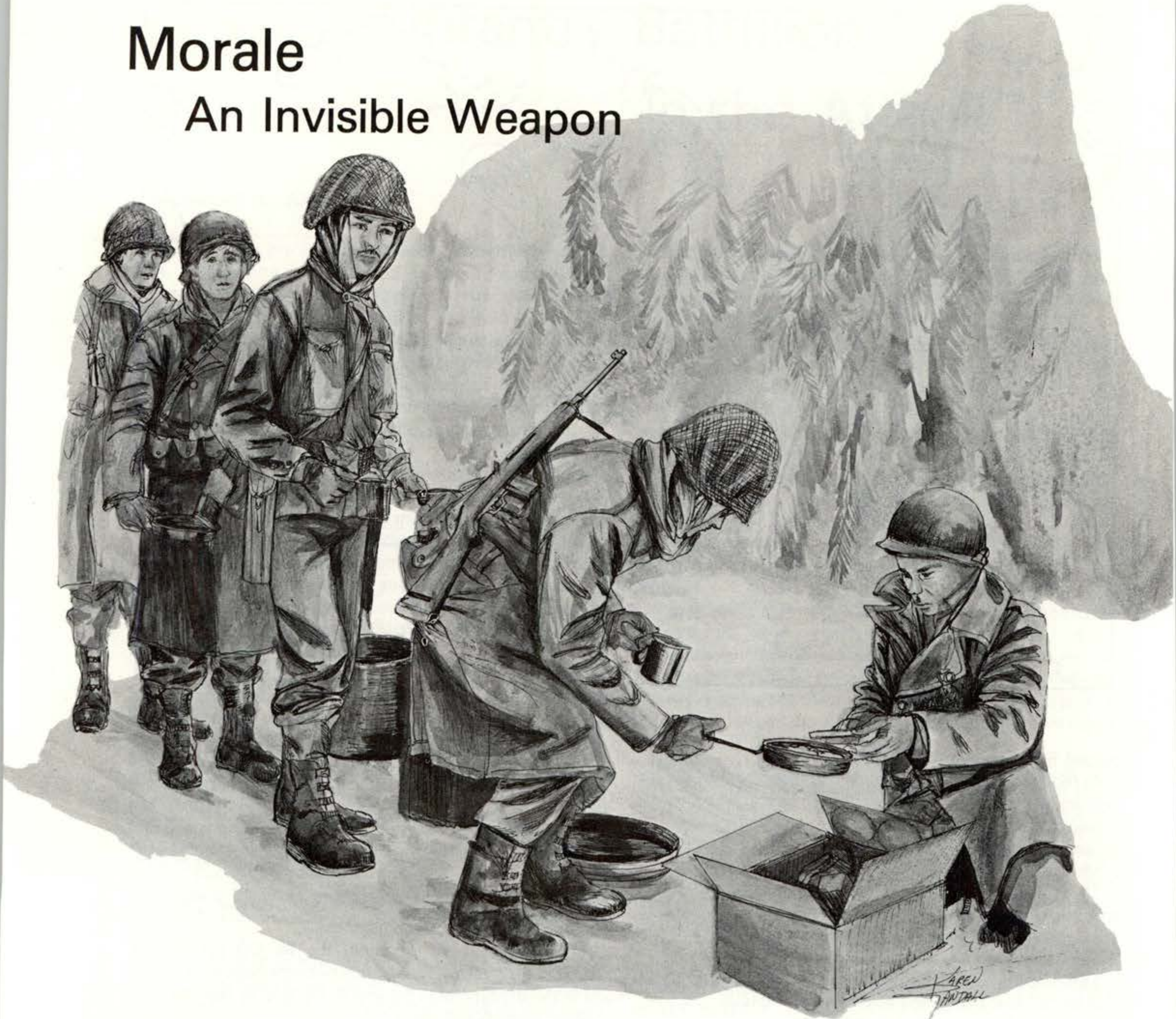
[51]J. Grexa and J. Smolik, "Projectile or Armor," *Atom,* No. 11, November, 1975, pp 328, 330.

[52]"Details of the Soviet T-72 Battle Tank," *International Defense Review,* Volume 10, No. 6, December, 1977, pp 1031-1034.

[53]"The New Soviet T-72 Tank," *Reserve,* March-April, 1978, pp 26.

JOSEPH E. BACKOFEN, JR. was commissioned in the Corps of Engineers upon graduation from the Polytechnic Institute of Brooklyn in 1966. While with the 62d Engineer Battalion, his service included Rome Plow Land Clearing Operations in Cambodia and Vietnam. Mr. Backofen is currently involved with the development of advanced weapons technology at Battelle Columbus Laboratories.

Morale
An Invisible Weapon



by Major Edgar L. Smith III

Whether on a frozen winter night or the hottest day in summer, there will be no "normal" situations during the "first battle of the next war." Our commanders and staffs are working hard to overcome present-day shortcomings in mobility, communications, and fire-power. But, if we will not possess superiority in either material resources or manpower at the outbreak of an armed conflict, then we must place emphasis on training, maintenance, and that ever-important psychological and intangible resource: *morale.* We cannot forget that our soldiers' morale and physical courage will be crucial in providing the cutting edge needed to win that first battle.

A premium must be placed on preparing our men and women to drop quickly the normal appeal of peaceful living for that of strenuous, responsive action. The power of morale has not increased over time, yet it is our least expensive available resource. As Chief of Staff of the Army in 1932, General Douglas MacArthur wrote that the power men exert in battle could be represented as the algebraic sum of a variety of elements, some of which are leadership, numerical strength, and morale. Do today's soldiers possess a responsive state of mind capable of adapting to a way of rigorous life requiring control of impulse, habit, and activity? One of our professional responsibilities in a peacetime Army is to insure that we are ready.

There are numerous accounts in early American history

which reflect the importance of troop morale. Our country's first major victory was achieved by a few thousand ill-clothed, hungry men who 7 days earlier had been chased across New Jersey and the Delaware River by British regulars and their German mercenaries.

On the day before Christmas, 1776, Washington's rebel army, without tents or blankets and many of them barefoot, huddled around open campfires at Bowman's Hill. It was bitterly cold, but on Christmas night they recrossed the Delaware. An hour before dawn, the ragged Americans stormed into Trenton. They fought superbly and killed or captured over a thousand of the rum-sodden Hessian troops. Lord Cornwallis immediately marched his regulars to counterattack, but Washington and his men outflanked him in the dark and smashed the British rear guard in the Battle of Princeton.

General Washington credited this victory over an enemy superior in numbers and equipment to the fact that his soldiers understood why they were fighting and that they believed their cause would prevail. Morale was a critical factor in that victory. There were few people in America or in Europe in December 1776 who could have believed that the sparks of rebellion could be kept alive against so powerful a nation as Britian. Many, unfortunately, were no more convinced in December than they had been in July. But the victory at Trenton demonstrated that it takes the individual soldier believing in himself, his fellow soldiers, his leaders, and his cause to win in battle.

On 2 December 1814, General Andrew Jackson arrived at New Orleans to find the city totally unprepared to withstand the attack being prepared by British troops. Jackson took immediate action in preparing defensive positions and called upon the entire population to work day and night in preparing the main line of defense southwest of the city. At no time during the defense of New Orleans did Jackson rely only on martial law and threats of punishment to arouse the citizens and soldiers to a sense of duty. He possessed a unique ability to infuse his personal zeal into the men under his command. He also made it clear to them why they were fighting and sacrificing.

General Pakenham, brother-in-law of the great Wellington, landed 10,000 British redcoats near Bayou Mozant and began

"... the soldiers knew what they were fighting for and consequently 'willed themselves to be free.' "

marching overland toward the city. Upon learning this, Jackson reacted quickly. On the evening of 23 December, Jackson led his men in a night attack on the British encampment. The result apparently was no more than the loss of a night's sleep on both sides, but American morale improved because the soldiers saw their general was a fighter.

By Christmas Eve, the American Army was dug in, its force concentrated for the fight, and artillery was in position. Pakenham attacked on 8 January 1815. The resulting casualties were 2,000 British and 21 American killed or wounded. In a later reflection of the American victory, Jackson emphasized the fact that the soldiers knew what they were fighting for and consequently "willed themselves to be free."

The Civil War was our country's first great war—a war which included more than a million men under a single national command. It was also the first time any major effort was made to turn the soldiers against a war. A number of organizations, known simply as the Copperheads, conducted a defeatist campaign to turn Union soldiers against the war. Speakers and pamphlets informed the soldiers that the Constitution was being destroyed by the Lincoln administration and urged the troops to desert. The Copperhead propaganda had a very demoralizing effect on the fighting spirit of the Union soldiers.

President Lincoln spoke frequently to Union soldiers and almost always explained what the blue-grey struggle was

"Men who had been wounded twice returned to the front after having their wounds bandaged. The courageous actions . . . were instrumental in seizing the gap. . . ."

about. Other commanding officers of Union troops made sincere efforts to educate their men about the reasons why they were fighting. Most units also received loyal newspapers, books, and magazines that were crucial in overcoming the influence of Copperhead propaganda and in raising morale. Such actions were necessary for a Union victory.

A sterling example of morale-building education in the Union Army was that of Colonel August Willich who, in the fall of 1861, was called upon to train and discipline an Indiana regiment. He initiated an education program to insure his men clearly understood why they were fighting. He felt this would make them braver and better soldiers. He coordinated a system of lectures and discussion groups on the causes and background of the war, as well as the international aspects of the Civil War. These lectures included the nature of Negro slavery and the character of American free institutions. Willich and his lieutenants read the lectures to the soldiers and led the discussions which usually followed.

The results of these educational programs were evidenced in July 1863, when Colonel Willich's regiment distinguished itself under fire in the Battle of Liberty Gap. Men who had been wounded twice returned to the front after having their wounds bandaged. The courageous actions by Willich's men were instrumental in seizing the gap from rebel pickets and in repelling a strong Confederate counterattack. The Indiana bluecoats simply would not be driven back from their fighting positions.

A soldier without ammunition who will keep his position until he can get some cartridges and open fire again is truly an exceptional soldier. General Buell was so impressed by the conduct of Willich's men that he wrote a General Order in which he recognized the officers and soldiers of that regiment for their gallant and efficent actions. Their superb conduct could easily be explained: They simply understood what they were fighting for.

The morale of the soldiers fighting for the Confederacy sank rapidly as the war years passed and war weariness replaced their initial enthusiasm. The notion that the war was a poor man's fight heightened discontent. The inequality of sacrifices, such as exemption from military duty of all who

owned 20 or more slaves, caused many disheartened troops to desert early in the war. A belief among many rebel troops was that the real meaning of the war was simply to uphold the property of the slave-holders.

Confederate leaders organized religious revival meetings in the camps so that soldiers could easily raise the question of the true causes of the war. The revival meetings took their minds off those issues and temporarily away from the war. Thousands of religious pamphlets were distributed by church organizations for the Confederate soldiers. Unfortunately, the purpose of this literature was not to educate the soldiers on why they were fighting but to get their minds off the war.

By late 1864, the number of rebel attacks had diminished and an air of defeat surrounded their camps. It is understandable that many of the Confederate leaders in the field could not satisfactorily explain to their men why they were fighting. Where education programs in the Union Army had succeeded in raising and maintaining the morale of the troops, Confederate soldiers were experiencing a collapse of morale.

In past conflicts, we had ample time to educate our soldiers to the immediate threat, the task that had to be accomplished, and the specifics required for combat survival and success. Today, personnel turbulence, routine of peacetime garrison duty, and the high cost of training pose a definite problem in attaining this end.

There are many practical measures that commanders and managers alike can use to insure that our men and women in uniform are fully aware of the looming Communist threat. These measures must be expressed in a straightforward, nononsense manner to instill a sound belief that we can defeat a Soviet offensive should it occur tonight, tomorrow, or sometime in the future. Every leader must perform a demanding role in maintaining our Army's morale. Most important is to talk to soldiers as often as time and circumstances permit. Whether collectively or individually, our influence is a valuable Army resource in molding and maintaining morale.

"Marching columns, military music, and our national colors and guidons have always strengthened the bond between our Army and its dependents, as well as the local populace."

Boredom, discontent, and inefficency are but a few of the many adversities we must cope with in a peacetime environment. Let the troops know of our reinforcement capability, the advantages of modern communication, and the efficency of our support capability. Emphasize that if our forces on the ground can hold out, we will win the next war. Our large, consolidated dining facilities offer an ideal area for delivering personal messages to the troops. Their questions will reflect a growing concern of many who want to belong to a winning team: How can we make the active defense work? We must talk about sacrifices and getting hurt, taking chances, and risking one's life. War has never been easy. Whole brigades may be eaten up in the active defense, and there may be some units with but a few survivors, just as in World War II.

Remember the monthly parades of yesteryear? The importance of ceremonies has always been instrumental in maintaining morale and *esprit de corps.* Parades have been used religiously throughout the history of our Army to recognize the achievements of individual soldiers, to evaluate units, and to reinforce the discipline and tradition of close order drill. The marching columns, military music, and our national colors and guidons have always strengthened the bond between our Army and its dependents, as well as the local populace. Our Army today differs greatly from armies in the past because of the large number of married soldiers. We must tell them how dependents will be taken care of in the event hostilities break out. Furthermore, we must keep our soldiers aware of our concern for their dependents. This is a big morale factor.

Building and maintaining unit morale requires time—time for training, time for maintenance, time for good physical training and sports programs, and time for education in military subjects. Good training must be realistic and useful to the soldier if it is to bolster morale. Live-fire training has always been popular with the troops. As soldiers get better at what they're doing, tell them so. Insure that your dining facility is run correctly and is preparing good food of the type the soldiers want. Upon completion of field exercises, allow sufficient time for squad leaders to perform the necessary maintenance on their vehicles, weapons, and equipment. Combat readiness is largely dependent on the individual soldier. Give him and his squad leader the time required to get the job done.

"... we cannot take [morale] for granted. . . . A dedicated responsive state of mind in our volunteer active force will be vital."

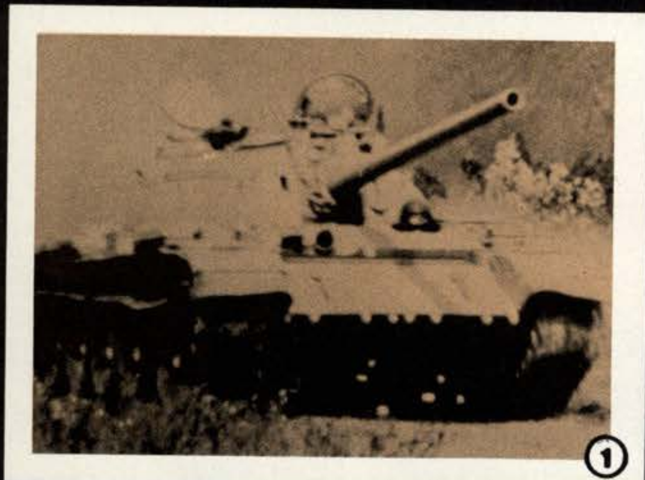
Morale is not everything unless all other factors of warfare are roughly equal. Our Army may not be able to resolve the funding problems for more material resources, but we certainly can prepare our soldiers with an indominable will for survival and success in combat. Although morale is the least expensive algebraic factor in combat readiness, we simply cannot take it for granted. Our nation is capable of reacting under stress—given time. A dedicated, responsive state of mind in our volunteer active force will be vital in providing that time. We must be ready to fight under adverse conditions, stay in that fight, and win.

MAJOR EDGAR L. SMITH, III was commissioned in Infantry upon graduation from Washington State University in 1966. He holds a master's degree in personnel management from Central Michigan University. An Armor Officer Advance Course and Command and General Staff graduate, his assignments include service in Germany and Vietnam. He is currently assigned to the 25th Infantry Division.

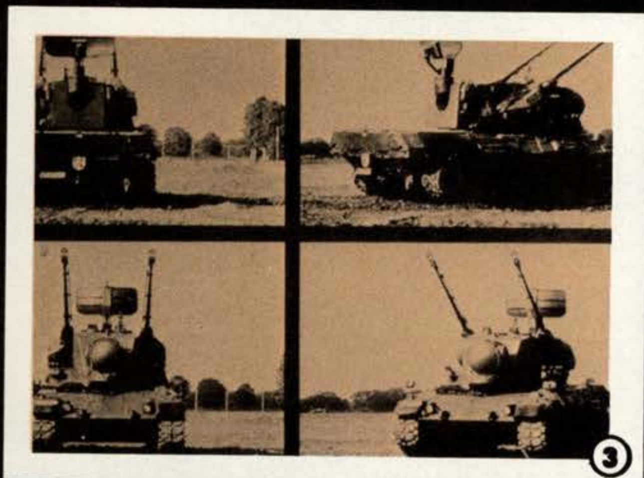
Recognition Quiz

This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

(Answers appear on page 60)


1

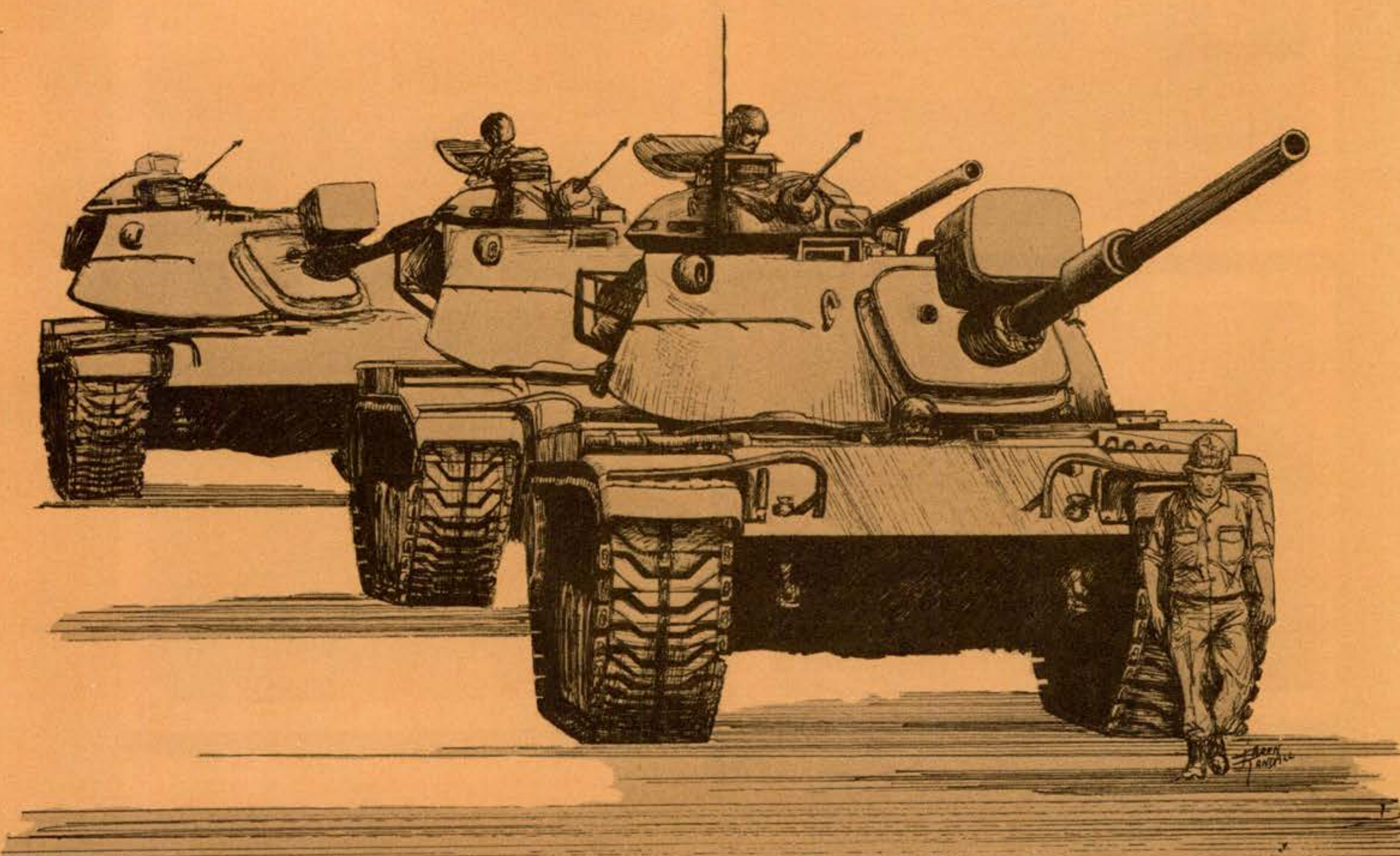

2


3


4


5


6



Armor Assistor

by Captain Frederick G. Lee

Under the revitalized "One Army" concept, priority has been given to filling vacancies in Army Readiness Regions (ARR) in an effort to upgrade the readiness posture of Reserve Components. The great emphasis now being put on Reserve Component readiness is relatively recent, and many officers and NCOs, upon receiving notice of assignment to such duty, have little idea of what to expect. To provide some enlightenment, the duties of armor assistors will be examined in detail. The Armor Team at Redstone Readiness Group (ARR IV), Huntsville, Alabama will be used as an example of

a typical assignment.

Prior to 1973, National Guard and Army Reserve units had Active Army advisors assigned at battalion level and above who lived in the town in which the unit headquarters was located. In 1973, after a thorough study of the effectiveness of that system, Project STEADFAST was implemented. Project STEADFAST called for the organization of nine Army Readiness Regions, with Readiness Groups being formed as subordinate elements of the regions. One of the major changes was to pull the advisors away from the battalions to form Branch Assistance Teams (BATs) in the readiness groups. In essence, this allows a team to pool its resources to give priority of assistance to a unit that needs it most, and it allows for more centralized control over the assistance effort. It also makes it easier for team members to stay current in branch related affairs by having access to more training materials and by interaction with other team and group members.

The Armor Team at Redstone serves National Guard armor units within the states of Alabama, Tennessee, and Mississippi. Located in these states are three separate armored brigades, one armored cavalry regiment, and one separate armored cavalry squadron. The armored brigades combined have a total of seven tank battalions and three armored cavalry troops. Each of these armor units requests help from the Redstone Readiness Group by submitting an "Assistance Plan" to Region IV Headquarters prior to the start of a training year. The requests are screened by the Armor Coordinator. Man-day allocations are passed to the Armor Team which then formulates a schedule of assistance after coordination with the respective units. Each assistor plans for approximately 135 days of temporary duty each year in which to execute the plan.

To meet the requirements of the plan the Armor Team at Redstone is currently authorized one lieutenant colonel (team chief), four majors, two captains, six master sergeants, two sergeants first class, and one clerk typist (DAC, GS-4). The working organization of the Armor Team has personnel broken down into Operating Elements (OE) of one officer and one or two NCOs. Each OE is directly responsible for two or three major units (normally two battalions/squadrons and a brigade headquarters). The OE maintains close contact with its units and is largely responsible for their branch related assistance. OEs are pooled when large instructor groups are needed. In the case of combined arms instruction, members of other branch teams (infantry, artillery, engineers) can be called upon.

The armor assistor functions basically in two ways when dealing with the National Guard units; as an advisor and as an assistor. He does not act in the formal evaluation role when dealing with units in the region because it is felt that to do so would be counterproductive to his relationship with them. He may, however, informally pass information which may have an impact on evaluation reports to the Armor Coordinator at Region Headquarters.

As an advisor, the armor assistor is expected to be able to give timely and doctrinally correct information and advice to the unit chain of command. This advice usually relates to tank gunnery, armor tactics, and training, but could be on anything that relates to armor unit operations. The assistor must always take care to give advice in a tactful manner and must not force his opinions on the unit; he should expect that sometimes his advice will not be taken.

It is in the assistance role that the assistor may be most productive, for it is here that he actually "does" for the unit. Assistance activities include instructing unit personnel in a variety of subjects, preparation and operation of tank firing ranges, conducting CPXs and terrain walks, and planning the layout and construction of new tank gunnery range facilities. The assistance is usually accomplished during the unit's weekend training sessions which are held once a month. It may also be done during the week in sessions with full-time members of the unit. To be most effective, the armor assistor, whether officer or NCO, should have an extensive background in tank gunnery because that area receives primary emphasis in training. Brigade and battalion staff experience is useful, particularly if it is in the operations and training field.

There are tremendous advantages to the current readiness group branch assistance team concept. Principally, it allows the team chief to form the most efficient size assistance team needed to do the job, and it allows him to send it when and where it will do the most good. Team members remain more current in armor affairs because of having broader contact with members of the armor community and by being involved in the varied training experiences of their National Guard units. There are better opportunities for formal professional development such as attendance at service school conferences and courses because other team members can compensate for the temporary absence of one. Also, because the assistors are not living in the units' hometown locations, they do not become overly involved with those units' problems and personalities. There are two chief limiting factors of this system. The assistor must spend many hours in temporary duty and travel which is inefficient and can become a morale factor, and because the assistor is often not with the unit, he may miss out on the critical planning phase of training.

Although the current system of providing assistance to Reserve Component armor units is not without some limitations, it is working very well. Its future success will depend upon a continued input of quality armor officers and NCOs, for it is these men who provide the vital link between Active and Reserve Components that makes the "One Army" concept work.

CAPTAIN FREDERICK G. LEE was commissioned in Armor through ROTC. He has an associate degree from Marion Military Institute and a bachelor's from the University of Alabama. A graduate of Armor Officer Basic Course and the Infantry Officer Advance Course, he has served in armor and armored cavalry troops in CONUS and Korea, including a tour as troop commander in the 3d ACR. Formerly an armor assistor with the Redstone Readiness Group, he is currently aide-de-camp to the commanding general of Readiness Region IV.

Autumn Safari Logistics

by Lieutenant Colonel Fred C. Cheatam

The tactical training received by the 194th Armored Brigade (Separate) during Exercise AUTUMN SAFARI (14 October-22 November 1978) was some of the best training ever received by any unit in the U.S. Army. This article will, however, explore only the logistics planning, training, and lessons learned during AUTUMN SAFARI.

Planning for AUTUMN SAFARI began shortly after the Brigade's return from Fort Drum, New York in February 1978, where it had participated in Exercise EMPIRE GLACIER. A special planning group chaired by the brigade executive officer, with representatives from each staff section and each participating unit, was established and monitored progress and resolved issues related to AUTUMN SAFARI. Milestone schedules were developed, briefed to the brigade deputy commander, and presented to the brigade commander for final approval.

The first major issue addressed by the planning group was to balance limited exercise funds, $3.1 million, with a training program and troop list that would permit the training of the maximum number of units within budget constraints. Detailed cost estimates of rail, civilian versus military air travel, repair parts, CTA-50-900 equipment, track usage, medical supplies, contractual services, and 12 other expense items were prepared. The final composition of the Brigade Task Force (table 1) was the result of a number of painstaking, juggling steps between the number of troops/equipment/training programs, and the limiting factor—money!

Table 1. Brigade Task Force Composition

HQ; HHC 194th Armored Bde	431st Med Det Hel Amb) (-)
4-54th Inf (Mech)	Cmd Avn Sect, 194th Armored Bde
5-33d Armor	194th Sig Plt
3-3d FA	Util Plt, HHC, 19th Engr Bn
75th Spt Bn (-)	12th Fin Det (-)
D/10th Cav	61st Med Det
G/1st Cav	C/1-7th ADA, Ft Bliss, TX
522d Engr Co	16th BPO Det, Persidio of San Francisco

The most important answer that had to be obtained concerned the types and amounts of equipment that would be available for loan to brigade units from the California National Guard and the Reserve Equipment Concentration Site. Every dollar that could be saved by drawing equipment at Fort Irwin could be applied to increased troop strength and/or training activities.

Deployment

Troop and equipment lists were finally approved, with last minute changes being made as late as 3 days before actual deployment. Then, detailed rail, air, CONEX/MILVAN, and on-vehicle load plans were completed. A Departure Airfield Control Group manned by the 19th Engineer Battalion, and an Arrival Airfield Control Group (AACG), manned by the 75th Support Battalion were activated, trained, and tested. Necessary blocking, bracing, and tie-down materials were requested, received, and issued to units and rail loading team training began.

Rail Loading

The brigade's experience in deployment and redeployment to Fort Drum proved that a specific unit not involved in the exercise should be appointed to coordinate and supervise the rail loading operation and Company B, 19th Engineer Battalion was given that mission. Vehicles to be loaded were marshalled in the brigade motor pool in the sequence that they would be loaded on the trains. Here again, some last minute changes occurred as vehicles were deadlined or a commander changed his mind. *It is essential that replacement vehicles or equipment be like-items or at least occupy the same space on the rail car; otherwise, the load plans will be "out of sync" in a hurry.*

Rail cars were spotted in a specific sequence at the rail loading site and loading began on 2 October. When completed on 11 October, the train consisted of 98 cars: 83 flatcars, 10 gondola cars (for CONEXs), 3 trilevel cars for ¼-ton vehicles, and 2 box cars. Total cargo consisted of 11 tracked vehicles, 234 wheeled vehicles, 84 CONEXs and 16 MILVANs.

The train arrived at Barstow's Yermo Marine Annex, about 25 miles from Fort Irwin, on 17 October and was unloaded by the 19th Engineer Battalion rail loading team. Tracked vehicles traveled 27 miles cross-country in convoy to Fort Irwin, while wheeled vehicles were infiltrated by road to Fort Irwin.

The decision to use gondola cars for CONEXs, instead of tying them down on flatcars as had been done for the trip to Fort Drum, resulted in significant time savings in loading and also provided added security at no additional cost over flatcars. Additionally, unit rail teams, which are trained and periodically tested, need to be a standing requirement for all units organized under modified tables of organization and equipment (MTO&E). As proof of the validity of the added proficiency in rail loading operations obtained through training, the same number of rail cars was loaded in only 4 days for the return trip to Fort Knox. This significant reduction in time cannot be totally explained by the added motivation of "going home."

Airlift

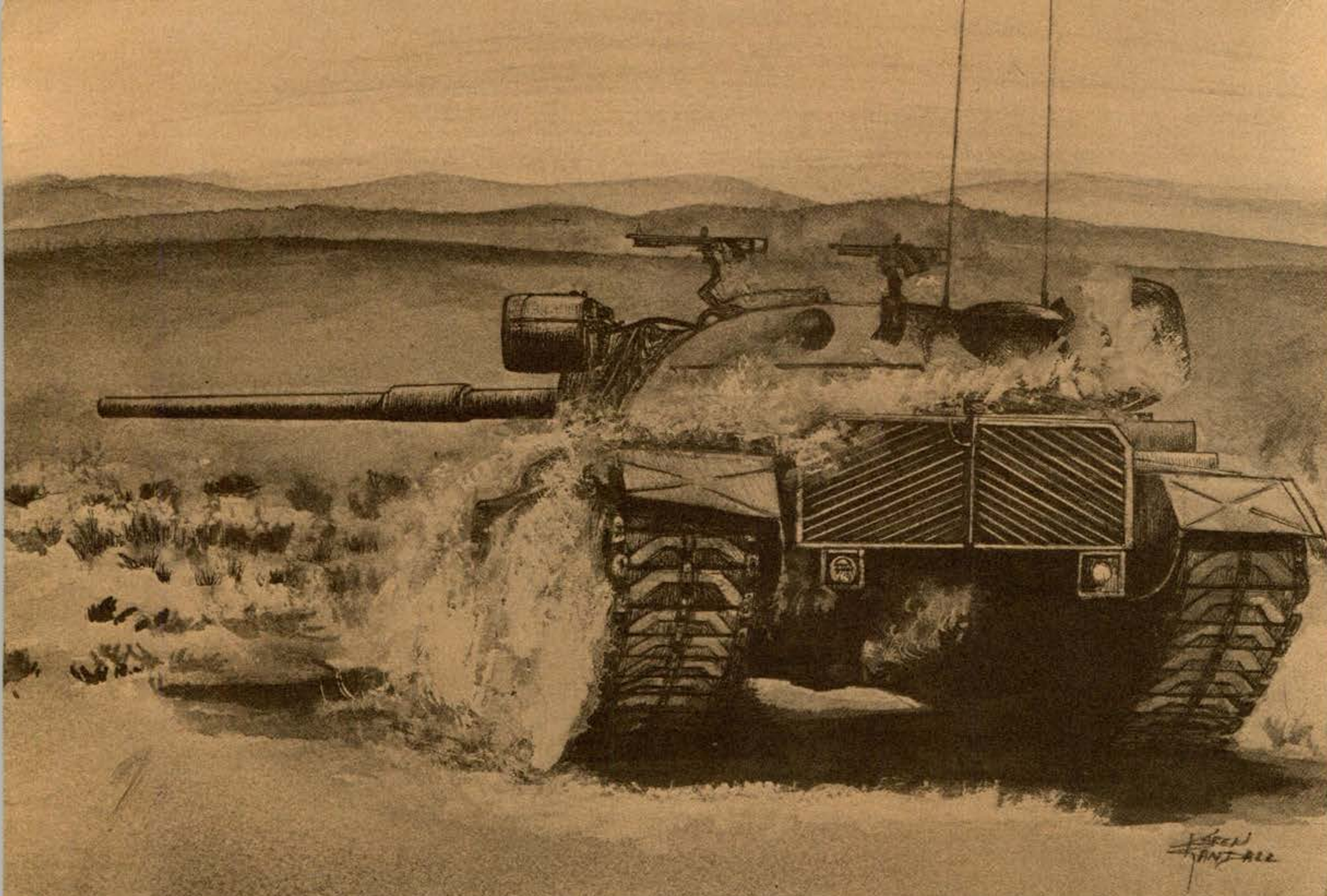
Movements were planned to insure that the troops arrived at Standiford Airfield, Louisville, Ky., 1 hour before boarding time. At the airhead, the troops were housed in heated tents, where they were served soup, coffee, and snacks while waiting for the completion of final checks of aircraft manifests. The operation was nearly flawless, with the only problems arising from aircraft delays.

Detailed planning proved to be the key to the effective operation of the AACG provided by Company B, 75th Support Battalion. Passengers and cargo were off-loaded directly onto waiting commercial buses and military trucks at George AFB, near Victorville, Calif., for the 75-mile movement to Fort Irwin. Personal baggage, which had been tagged with unit color-code markings, was moved by trucks drawn from the Fort Irwin Reserve Equipment Site and operated by personnel of Company C, 75th Support Battalion. Unit color-coding proved to be highly effective in getting personal baggage to the proper unit. However, individual pick-up of baggage was accomplished through an "honor" system, resulting in the loss of a small amount of gear. Color-coded claim checks will be used to ensure greater security of personal baggage on future deployments.

The airlift phase of the deployment also included the *OH-58, UH-1H,* and *Cobra* helicopters of the brigade's command aviation section and Troop G, 1st Air Cavalry Squadron, which were shipped by *C-5A* aircraft to save helicopter flying hours. CONEXs containing sensitive items, such as crew-served weapons and some communication and electronic equipment, were also shipped by *C-141* aircraft. The only problem encountered during the equipment airlift was with the helicopters which were flown to Standiford Field for disassembly and loading on the *C-5As.* The problem arose because the Air Force was late in designating the Air Lift Control Element (ALCE) which would control the move. Therefore, the degree of disassembly required for the helicopters was not known, resulting in some unnecessary disassembly. This relatively minor problem did not exist during the return trip.

Equipment Issue

The entire exercise was treated as a practice deployment to an active overseas theater. Equipment was drawn in much the



same manner as POMCUS (prepositioning of materiel configured to unit sets) stocks would be. In fact, the California National Guard had the equipment lined up in company sets—an arrangement that enhanced the training value of the exercise and greatly simplified the issue process. The key to issue, and later turn-in, was a thorough technical inspection (TI) by the driver or crew before signing for the equipment. But even though the need for a thorough TI is preached and reaffirmed during every off-post exercise, a small percentage of the troops still failed in this regard, thereby causing an unnecessary expenditure of time and funds.

Field Operations

Based on the training plan developed months before, the brigade deployed to the field on 20 October 1979 to operate in accordance with the following broad schedule:

20-27 Oct: Company/Team Training
1-6 Nov: Battalion/Task Force Training
9-16 Nov: Brigade FTX

During 28-31 October, some equipment and training areas were returned to National Guard control for use in a previously scheduled exercise. This period, as well as 7 and 8 November, was used for maintenance and preparation for the next training phase.

Maintenance Contact Teams had been formed at Fort Knox and had joined the supported unit before departure. Each team's MTO&E was modified to fit the needs of a particular supported unit based on the unit's expected activities. For example, if the unit was to be engaged in tank live firing, the contact team was "beefed up" with additional turret/armament mechanics. As the exercise progressed, it became apparent that a qualified inspector was needed in each contact team to determine the repairs required, the level of maintenance at which they should be made, and whether repairs could be made on site or if evacuation was needed. These inspectors became essential members of the teams and provided the contact with the direct support maintenance company that was needed to improve dramatically the maintenance effort.

Weaknesses of the contact teams stemmed from their lack of organic radio communication and lift capability, which significantly reduced responsiveness and flexibility and caused substantial delays. Additionally, contact teams lacked armor protection and mobility commensurate with the support force. These deficiencies must be corrected if we are to "fix forward" in a shooting war.

Shakedown of Personnel and Equipment

The company/team training week served as a shakedown for both personnel and equipment. Crews learned that the Mohave Desert, unlike the ones they had seen in movies, has a fairly hard-packed surface interlaced with deep gullies and rock outcroppings. This environment caused two major problems—suspension damage and loss of power due to clogged fuel filters.

Final drives were sheared and road wheel arms were pulled from hulls because crews were operating over strange terrain. The problem was relatively easy to overcome, however, through increased command emphasis and driver experience which restricted over 90 percent of the driver-related suspension damage to the first week's field training.

The loss of power was more serious, and at one time nearly 30 percent of the *M-48A5* tanks drawn from the California National Guard were inoperable from this problem. At first, the problem was thought to be bad fuel or faulty injectors.

However, analysis quickly proved that the fuel was good and the investigation turned to the primary and secondary fuel filters. While some of these were clogged and needed to be replaced, the problem was not totally solved.

Finally, the real culprit was discovered—the injector pump filter. Corrections were made and the problem of loss of power almost disappeared for the remainder of the exercise. The lesson learned is not new. It is obvious that maintenance of air and fuel filters in a dusty, desert environment is critical, but it is a lesson that seems to have to be learned again and again.

Table 2. Major Component Usage

	M-48A5	M-109	M-113	M-88	M-578	GOER	5-T	2½-T
Engine	6	2	9	3	0	1	5	1
Transmission	6	0	10	0	2	0	0	0
Transfer	N/A	N/A	10	N/A	0	0	4	1

Table 2 illustrates the problem of replacing major components throughout the exercise. What is not shown is that in many cases the number should be multiplied by 2. The California National Guard had requisitioned what was believed to be sufficient quantities of components to cover the exercise. However, shortages in the supply system coupled with hard usage, which included an average of over 550 miles for each tracked vehicle during the exercise, quickly used up available assets. The only solution was to pull good components off other California National Guard vehicles. This resulted in double work for unit and direct support (DS) maintenance personnel.

Two logistical lessons were learned from this experience. First, insure that adequate stocks of major assemblies are on hand prior to the exercise. Consider bringing all that is possible from home station. Second, and of more importance to the Army, is the fact that many DS level maintenance personnel can not perform organizational maintenance. In fact, they are not taught these skills at their branch school. This is a serious training shortfall that must be overcome to get vehicles back into combat as rapidly as possible.

Battalion/Task Force Training/Brigade FTX

During the battalion/task force training and the brigade FTX phases, logistics in the 194th Armored Brigade really began to come into its own. The tone and direction for both phases of the exercise were set by the brigade commander when he stated that all forward resupply would be performed at night in *total blackout*. Field train elements were not allowed to depart the brigade support area before dark and were required to return before daylight the next morning over one-way distances exceeding 70 km on some occasions.

The soldiers' traditional fear of night operations was heightened by unfamiliar terrain with few recognizable landmarks. But, that is a condition we can expect in combat. With the known air power of our most likely adversary, the only way logistics operations may be able to survive is under the cover of darkness. In any event, the commanders at all levels faced a difficult problem, never before confronted by most, that had to be solved under real world conditions of distance and time. In fact, if the supplies did not get through, the brigade could not function the next day!

During the battalion/task force period, it was as black as the proverbial landlord's heart. Thus, the most difficult training period—the beginning—was conducted under the worst possible conditions of visibility. Many problems were encountered. Drivers became lost, and some units did not eat until after midnight, but the brigade learned—fast. The soldiers' confidence in themselves grew daily. They proved that they could safely travel great distances in total darkness; get where they were supposed to go; rearm, feed, resupply the troops, and return without once using white light of any kind including blackout markers.

Brigade FTX

Brigade field trains moved to the field on 8 November and were operational by 1200 hours. In addition to the 75th Support Battalion units, each maneuver element and the 3-3d Field Artillery Battalion Field Trains set up in the Brigade Support Area. Air Defense protection consisted of dispersal, extensive camouflage over all installations, and placement of units under a *Hawk* air defense umbrella.

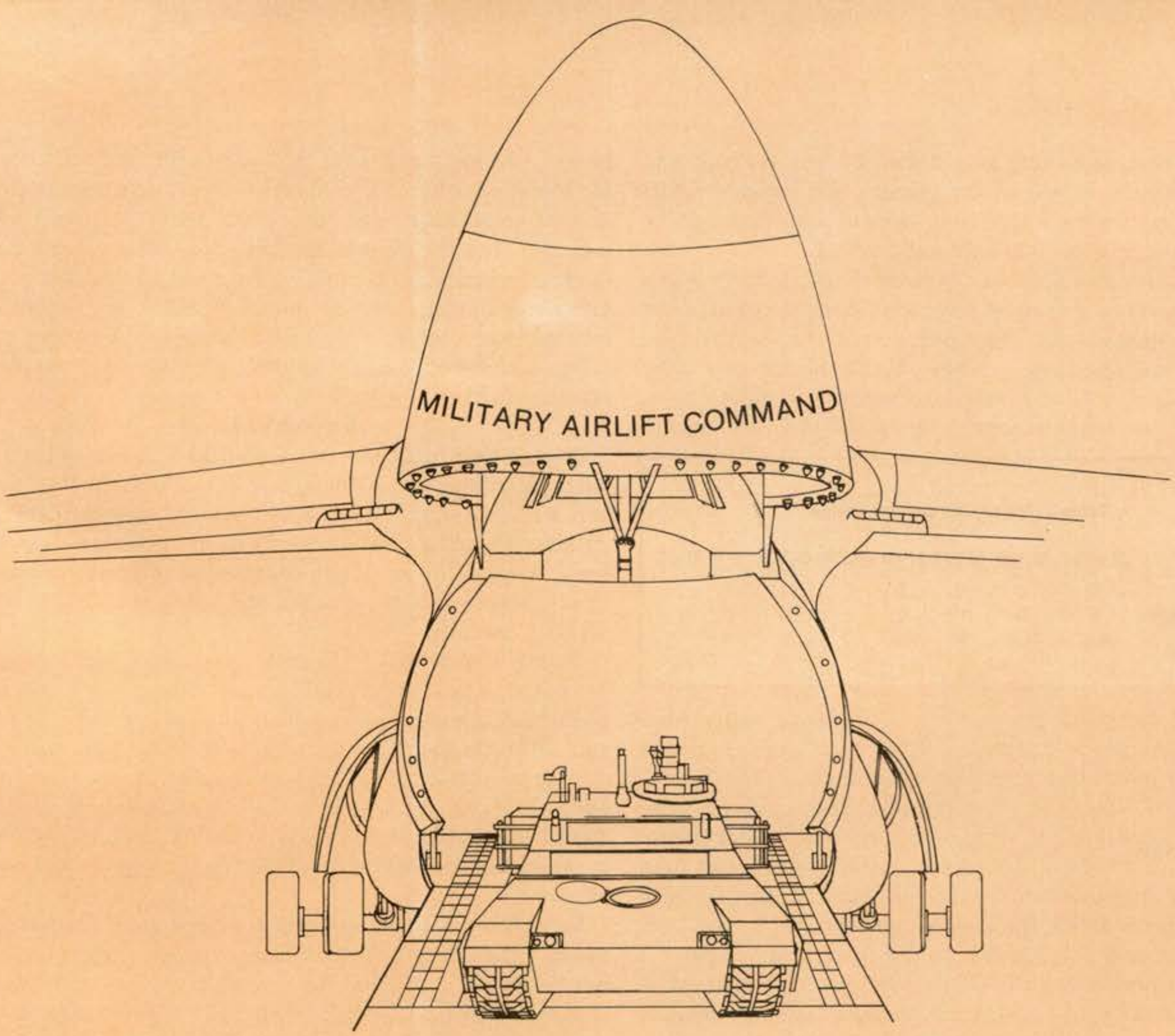
With a brigade support area that measured roughly 2½ by 1¼ miles, integrated defense plans in the classic sense were not practical. Each unit had to establish its own perimeter to provide as much all-around security as possible. Each unit, including companies of the support battalion, formed, trained, and tested ready-reaction forces and a mobile Brigade Support Area Ready Reaction Force was trained to respond anywhere in the area under the control of the brigade support area commander.

Security of the trains area creates a dilemma. Units that normally operate in or from the brigade/division support area are not organized or equipped to provide support and defend themselves adequately despite what the TO&E might say; it simply cannot be done adequately. The force commander is faced with several conflicting considerations. First, should he divert perhaps critical combat power in terms of ground maneuver units, air defense artillery, conventional artillery, or air assets to support area security.

The threat, of course, is the deciding factor. As a minimum, air defense coverage is essential. Also, conventional artillery coverage should be provided, whenever possible. In future conflicts, it is probable that significant ground forces are going to have to be diverted at some point to secure logistics installations, and that fact must be considered by the commander in his allocation of combat power.

The second consideration facing the commander is the time/distance factor. The depth of the modern battlefield allows the commanders to use that depth as a passive defense against both air and ground assault on his logistics installations. Yet, the very distance that provides some degree of security also significantly slows the responsiveness of support. During AUTUMN SAFARI, it was common for the brigade trains to operate from 40-70 km behind the FEBA, and it was not at all unusual for the field trains of the maneuver elements to leave the brigade support area at about 1810 and not return until 0530 the next morning.

In the scenario the brigade was playing, the threat of air attack was the greatest danger, and resupply after dark was considered essential. The added security was felt to outweigh significantly any inconvenience to the troops. Thus, while the brigade trains were as secure as the passive measures of dispersion, camouflage, and distance could make them, the support the maneuver units received was not responsive as it would have been had the doctrine of only keeping the trains' position out of light artillery range been followed. The commander



made the decision that the degradation of support was necessary in view of the threat, and that is a decision that must be considered in the scheme of maneuver.

Additionally, when discussing responsiveness of logistical support, it must be noted that the real heroes in this area are the field train elements of the maneuver units—not those of the service support units. It is the support platoons or the service batteries that must move the bulk of the fuel, food, ammunition, and parts forward. Their's is a hard lot—and a crucial one. The maneuver or combat support unit commander would do well to remember that fact when selecting his support platoon leader.

To illustrate this crucial role of support units and their leaders, one night of logistical operations during AUTUMN SAFARI is described below.

Night Logistics

It is 0600 hours and the field trains elements of Task Force 4/54 Infantry (Mech) are closing into the brigade support area. While the POL tankers move to the brigade bulk Class III point to "top off," mess personnel begin the long and difficult job of cleaning up mermite cans and coffee urns used in last night's feeding operations. At the same time, the support platoon leader reports to the commander of the support battalion to be debriefed on last night's operations; problems are discussed, priorities for maintenance and/or supplies are agreed on, and planning begins for tonight's operation. Maintenance personnel from the 4-54th Infantry (Mech) and Company D, 75th Support Battalion begin work on repair jobs that are most critical to that day's operation, while the ammunition folks get some well-deserved rest.

At 1200 hours, the next day's rations are ready for issue and mess personnel move to the Class I point. Upon returning to their unit area, they must begin to cook the evening meal that will be moved forward in mermite cans to the troops that night. The meal is complete by about 1700. While it has been cooking, there has been much activity and little rest for support platoon members. Maintenance has been performed to get all platoon trucks in the best possible shape for the night's operation. Coordination with the support battalion has been made to make a direct exchange (DX) of some unserviceable sleeping bags. A tank and pump unit has been found to replace an inoperable one and repair parts have been obtained for forward repair work. Final coordination on recognition signals between the support battalion and TF 4-54th trains has been accomplished. Coordination has also been made with the field train elements of TF 5-33d Armor and 3-3d FA because elements from these units are also part of TF 4-54th. It is time to organize the resupply convoy.

The support platoon leader coordinates with the task force executive officer to determine the disposition of TF 4-54th elements on the ground and the convoy is organized accordingly. Each task force element will receive a logistical package consisting of food, fuel, ammunition, and maintenance support. The convoy is organized with these "packages" in sequence with the most forward unit's package first in the convoy, and so on. Each driver is briefed on the route that will be covered, emergency procedures in case of attack or accident, check points, recognition signals, and action to be taken upon arrival at the Task Force Logistical Release Point (TFLRP)—a point on the ground selected by the task force executive officer or S-4 and radioed to the support platoon leader.

As soon as the last rays of the sun vanish, the convoy moves

out in total blackout. Brigade MPs, arranged for by the support battalion, provide guides at critical points. Always maintaining radio contact with both the Support Battalion and TF 4-54th, the convoy begins the long journey that will bring it to the TFLRP.

At the TFLRP, red-filtered flashlight recognition signals are exchanged and logistics packages are married with respective unit representatives. All this takes less than 5 minutes, and the road, which had only minutes before been filled with a convoy of 20-25 trucks, is now empty, as each logistics package is led forward to feed, fuel, fix, and rearm the force.

At the company team level, well-rehearsed resupply procedures take place and in a short time and all vehicles are topped off. The troops are fed hot meals, their only one of the day. Ammunition is distributed, and repair parts are provided to combat trains maintenance personnel. In TF 4-54th, all this takes no more than 2½ hours from the time the convoy arrives at the TFLRP!

Upon completion of their resupply mission, logistics package elements move directly to the convoy collection area—a point on the ground different from the TFLRP—and unit executive officer/first sergeants rendezvous with the support platoon leader to coordinate the next night's resupply effort. When all packages have returned and tentative plans completed, the task force field train begins the long trip back to the brigade support area where the cycle will begin again.

Lessons Learned

- Crew maintenance is critical if you want to ride instead of walk.
- DS maintenance personnel must know organizational maintenance
- A pack can be changed in a driving sand storm.
- Truck drivers have to be able to read a map as well as the tanker.
- The night does not hold the terrors we thought.
- *Most of all, we learned that the logistical systems will work only if we work as an integrated team.*

There were serious artificialities in the exercise. In addition to the fact that there were no real bullets flying, two other conditions precluded total exercising of the field logistical system. First, repair parts supply (Class IX) could not be played realistically due to the Fort Irwin system. The California National Guard has few full-time personnel to operate its fixed Class IX facility. Brigade personnel had to augment the National Guard's manning and as a result could not operate the brigade Class IX facility in the field. Therefore, Class IX problems of resupply and mobility of authorized stockage list items were not tested.

While all this may sound simple, it is far from it. A battalion-sized maneuver force has been resupplied in an amazingly short time over a considerable distance, (up to 72 km one-way in a couple of instances) in total blackout. It was accomplished by extensive planning, coordination and training, and most of all, the dedication of the individual soldier to get the job done; a job that is never ending and for which he can expect to receive little praise and less sleep. In truth, the support platoon members of today's Army are its unsung heros who will and must play a crucial role in the combined arms team. To paraphrase Rommel, "The Quartermasters decide which side is going to win the battle before it's fought." It is the "little guys" in the support platoon who ultimately turn the "Quartermaster's" plans and decisions into the reality of hot chow, POL, and ammunition in the hands of those who need them.

The foregoing describes only one night's logistical operations during AUTUMN SAFARI, but it is indicative of the remainder of the exercise.

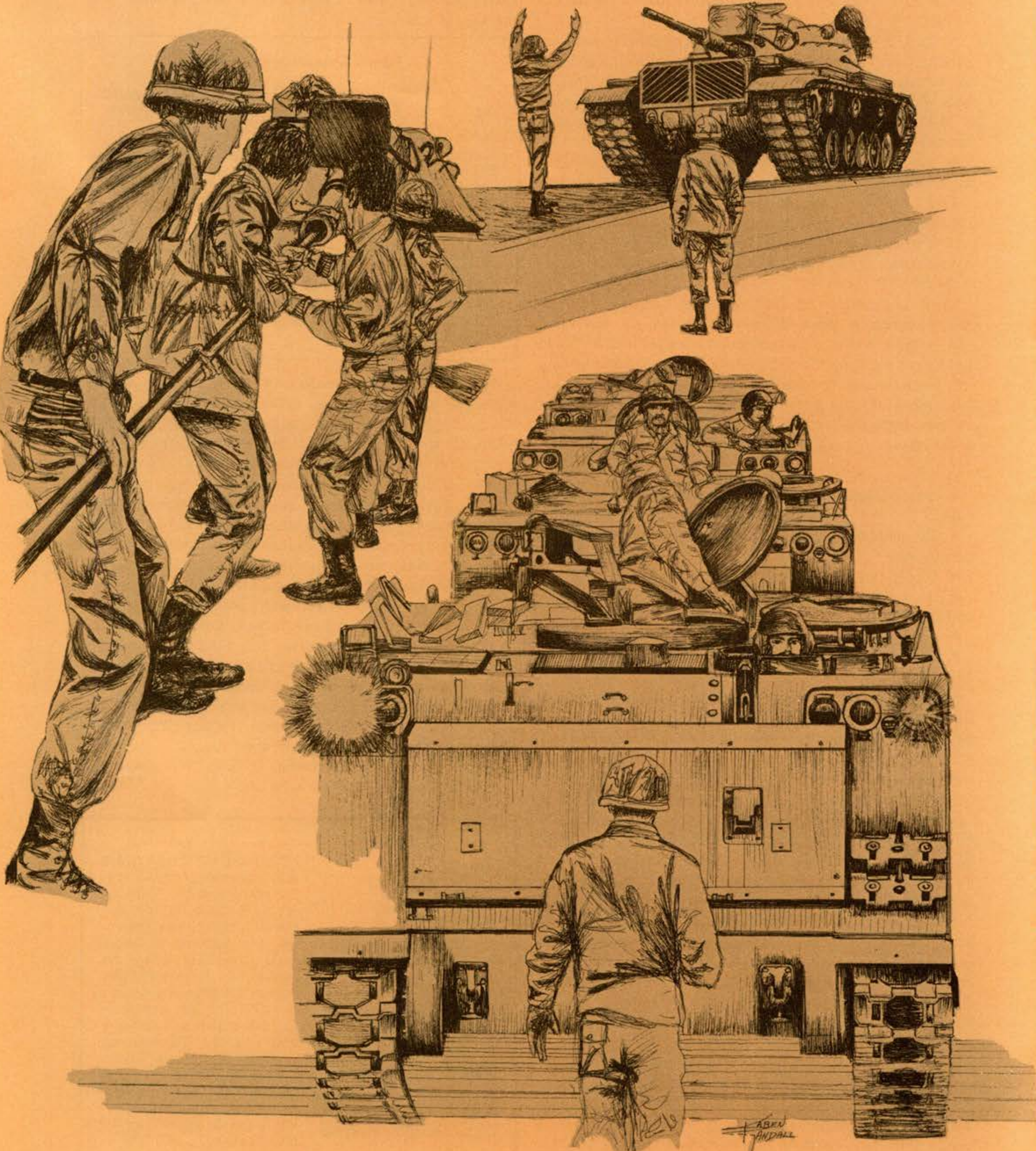
Table 3. Ammunition Expenditure

TYPE	EXPENDED	BASIC LOAD[1]	% BASIC LOAD
5.56-mm	108,898	120,120	90
7.62-mm	170,200	405,000	42
.50 Cal	80,700	118,570	68
81-mm (all types)(Mech Bn)	937	1,080	87
4.2-mm (all types)	2,080	640	325
105-mm (all types)	3,118	3,726	84
155-mm (all types)	1,837	1,430[2]	128

[1]Basic load data based on FM 101-10-1, July 1976 for 1 pure tank battalion unless otherwise indicated.
[2]Basic load data for one 12-gun battalion (all that were available at Ft. Irwin).

More significantly, ammunition (Class V) resupply was not realistic due to consolidated tables of allowance restraints. One resupply per night, as was the case during AUTUMN SAFARI, will not be enough. As result, one of the most serious problems facing the U.S. Army—that of how to rearm during intense combat—was not tested nor practiced adequately. Table 3 shows total Class V expenditures during the entire exercise. While the expenditures appear great, they are, in many cases, significantly less than one basic load. Many feel that two or more basic loads will be fired *per day* in the first battle! Doctrinal and equipment solutions to this problem are in process. The ammunition transfer point (ATP) concept is good, as is the long-overdue Armored Forward Area Rearm Vehicle (AFARV) development, but training remains the number one problem. In most exercises, we simply "assume" away the problem hoping that the required ammunition will "appear" when needed. To train like we will fight in a "come as you are" war, we must play ammunition resupply realistically with the current equipment problems, packaging problems, and personnel shortfalls in order to find workable solutions or, at least the best solution.

LTC FRED C. CHEATHAM was commander of the 75th Support Battalion, 194th Armored Brigade (SEP) at the time this article was written. He is a graduate of Texas A&M University where he earned his bachelor's and master's degree. A graduate of CGSC, he has served in various logistical positions and was G-4, 2d Armored Division, Fort Hood, Texas, prior to assuming command of the 75th Support Battalion. He is currently serving in the Directorate of Armor Doctrine, USAARMC.



"It is worthy of note that in this first debarkation of tanks by American Troops. . . all tanks arrived at the tank shed two and one-half hours after the train had halted at the crossing. This shows the adaptability of the American soldiers."
—Col. George S. Patton Jr.
("The Report of Personal Experiences in the Tank Corps")

The details of endurance, personal courage, and true Tank Spirit during the fight and in the long hikes and rides to the new sector are too numerous to mention in this work, but they shall long be remembered by the members of the battalion and by those associated with it."
—Maj. Sereno E. Brett
(Report of Dec. 14, 1918)

"I can tell you as far as the 1-66th being able to pick up and go somewhere and showing that guy on the other side of the Iron Curtain that we have that capability, that they've performed that mission superbly. I think the whole country should be grateful for that, because that's one element of deterrence. They did it in an uncommonly short period of time, and the reports coming back from Europe are absolutely superlative about what that battalion has done."
—Gen. Edward C. Meyer
(Speech to the Association of the U.S. Army, October 1979)

ELIGIBLE RECEIVER II

by Specialist Four Lee Roy Dewitt

The 1st Battalion, 66th Armor, 2d Armored Division—first called the 326th and later the 344th Tank Battalion—conducted the first American tank attack in history on Sept. 12, 1918, at St. Mihiel, France.

More recently, the battalion from Fort Hood, Texas, conducted the first Emergency Deployment Readiness Exercise (EDRE) that was not part of a REFORGER maneuver. General Meyer's reference to the unit's most recent mission, reflect the same remarkable characteristics that Patton and Brett described. The 61 intervening years have had no adverse effect on the fighting spirit of the 1-66th.

When the battalion attacked St. Mihiel, the soldiers were called heroes. Today, in a peacetime environment, they are just doing their job. Nevertheless, the same dedication, elan, and endurance are necessary for the successful completion of any mission, whether it be the mandate of battle or the demand of a training exercise.

Unlike a REFORGER maneuver, which usually involves months of intensive preparation, the EDRE began without preamble. The no-notice element of the exercise was important because it effectively tested the unit's continuing deployment capabilities.

The 1-66th soldiers, no doubt contemplating weekend diversions before the exercise was announced October 11, were probably as surprised as their commander, Lieutenant Colonel Albert G. Folcher, Jr., who related how it all began: "The battalion had just come back from gunnery and a major field exercise when my brigade commander called and said, 'You are going to Germany.' I asked when, and he said, 'Now.'"

A Defense Department spokesman referred to the test, called ELIGIBLE RECEIVER II, as one of the most realistic exercises held for Army units and said it would provide valuable planning information concerning the unit's ability to deploy, draw prepositioned equipment, and be ready for combat.

The battalion's mission was to make a no-notice deployment to Germany, draw all of its major equipment from storage sites, move to a training area, and undergo training and testing.

The exercise was conducted in eight phases: alert and assembly, preparation for deployment, deployment, reception and issue of POMCUS (prepositioning of material configured to unit sets) FTX and weapons firing, POMCUS turn-in, preparation for redeployment, and redeployment.

After the alert was initiated and the soldiers were assembled, processing for overseas movement began, followed by equipment inspections, and the issue of cold-weather gear. This was accomplished in about 30 hours by the 217 men who made up the advance party. Like the soldiers of the main body, who deployed 24 hours later, they left with only their personal equipment.

The logistics of a battalion move are awesome. Last-minute searches for misplaced items, preparation of deployment

packets, TA-50 and Zone VI clothing issue, and immunizations characterized the preliminaries for deployment.

In short, everything the battalion uses in day-to-day operation, except the prepositioned vehicles in Germany, was packed and readied for shipment.

Most of the men were already exhausted from the long hours, but many found it hard to sleep on the plane. It was a sleepy battalion that peered out the windows as the plane descended to Ramstein Air Base, Federal Republic of Germany.

But there was no rest for the weary. The main body joined the advance party, which had already drawn the prepositioned equipment from its warehouse, and together they labored to prepare for convoy.

Drawing Equipment

The advance party's job was to deploy quickly and draw the major items of equipment from storage sites. It accomplished this in record time. POMCUS is equipment in Europe that is identified for use by a U.S.-based unit in the event of an emergency situation.

POMCUS facilitates faster deployment overseas, because it allows the units to leave their tanks, trucks, armored personnel carriers, and ammunition in the U.S. and pick up duplicate equipment upon arrival overseas.

"The United States is committed to the defense of Western Europe," explained Major Michael A. Andrews, the battalion's executive officer. "There are many ways of doing that. One way, a traditional way, has been to position troops there, to occupy physically the terrain and to live there, and be prepared to maintain a force in that way.

"This is an alternative, and the soldier finds it rather interesting, if we can get there fast and draw our equipment and be able to reinforce from a base in the United States. This contributes significantly to that mission without physically having to occupy the terrain with more and more U.S. troops."

POMCUS equipment is issued in a battalion set and is broken down to company-level elements after it is received. Therefore, it is necessary to know exactly what each company is authorized in order to get it down to the user as quickly as possible.

Drawing equipment was not only a race against time. It was a race against fatigue as well. A maze of muddled thoughts, spent energy, and twisted nerves is the byproduct of long, arduous hours, and in time fatigue could begin to hinder severely the battalion's efforts.

There were problems inherent in drawing a battalion's entire stock of prepositioned equipment, and organization, good leadership, the ability of the soldiers to maintain their morale, and to keep working throughout the night and bad weather were essential to the operation. Organization and forethought in exactly what had to be done can save considerable time and were the basic issues of the entire concept.

The POMCUS draw began calmly enough with a briefing, but as one soldier related, it was a shock to gaze upon the mass of equipment. "We were told what we had to do when we got to the POMCUS site, but when they opened the doors and we looked in, it was hard to believe the amount of equipment. You couldn't even walk in sideways. There were deuce-and-a-halves, five-tons, jeeps, gama goats, everything."

The initial battalion draw was controlled by a unit composed of smaller company teams. With this system, company ex-

ecutive officers could be directed to revert from the battalion organization to a company organization to facilitate the organization of equipment into company sets.

"The primary concern at the POMCUS site was more than just drawing equipment, because POMCUS is really two operations," said Major Andrews. "One is the timing of the drawing of the equipment. That is interesting, but it certainly doesn't tell us very much about whether the unit is ready to perform its work on a mission. It still has to break down that equipment to company level and check to make sure that it is operational."

Also, involved in the secondary phase of drawing POMCUS was the distribution of basic issue items (BII)—a lengthy process that involved thousands of items. Then ammunition was loaded, and a 10-mile road test was conducted before moving to the Grafenwoehr Training Area, 110 miles north of Munich.

The 1-66th drew its POMCUS gear in record time for an armor battalion. "I believe the battalion is setting new standards which senior planners will have to reevaluate, because I think the time it takes to deploy to Europe can be cut substantially," commented Lieutenant John R. Pena, HHC commander.

"The whole battalion has been unbelievable in what they have done. Unless you experience this you don't really understand what has happened," said Lieutenant Pena. "People say training is always number one, but training is just one step. The character of a battalion is just as important. Can they be pushed to the very limits and still maintain the type of standards that has made the battalion very good?"

Although the records set by the battalion are classified, they are tacit evidence that the unit can indeed maintain superlative standards. Those records support one journalist's statement that "the battalion can justly claim to be the Army's best tank battalion."

From the POMCUS area, the tactical vehicles were railloaded for shipment to Grafenwoehr, and at the same time, the wheeled vehicles began a convoy to the training area.

Almost immediately upon its arrival to Grafenwoehr, the battalion assembled tactically and was tested by a VII Corps evaluation team. It was the first U.S. unit to undergo a Corps Organizational Readiness Testing Program, which is required by all Europe-based units.

"What was specifically significant about the the test was that the men had not had a break since arriving, and they took the test without any pretactical training," explained Lieutenant Colonel Folcher. "They just went in and took it, and they did very well."

At Grafenwoehr, the battalion settled down for tank gunnery exercises. Considering that the tank crews had just completed their annual gunnery at Fort Hood, the soldiers may have questioned the necessity of additional training. But there were good reasons behind the scheduling of tank tables IV and VII—the gunnery served to test the reliability of the POMCUS equipment after storage, as well as introduce the tankers to the gunnery methods employed in Europe.

Gunnery standards are the same in Europe and the States, but the USAREUR training, according to Captain William M. Bewley, S-3 of 1-66th Armor, is more innovative and allows the crews to react under realistic conditions.

"USAREUR gunnery places emphasis on how fast the crew can kill the enemy, not how quickly they can fire," explained Captain Bewley. "It's logical. Who cares how quickly you can get the round down range if you don't hit the target. In the States, your time is recorded when you begin the engagement and stopped when you have ceased fire or used the prescribed amount of ammunition, whether or not you have hit the target." In USAREUR, the time does not stop until all the targets have been killed.

A crew's proficiency on the ranges was illustrated by how quickly they completed the training. According to one soldier, they were expected to run no more than 9 or 10 tanks down range in a day, but the battalion ran anywhere from 13 to 15 tanks a day.

The return trip to the POMCUS storage site was again by rail shipment and highway convoy. Before the equipment was turned in, each of the thousands of individual pieces of equipment, from wrenches to 5-ton trucks, had to be thoroughly cleaned.

The idea was to leave the equipment in its original condition. "The equipment we drew was in excellent condition," said Lieutenant Colonel Folcher. "On our way to Grafenwoehr every vehicle made it, and when we returned, every vehicle made it back."

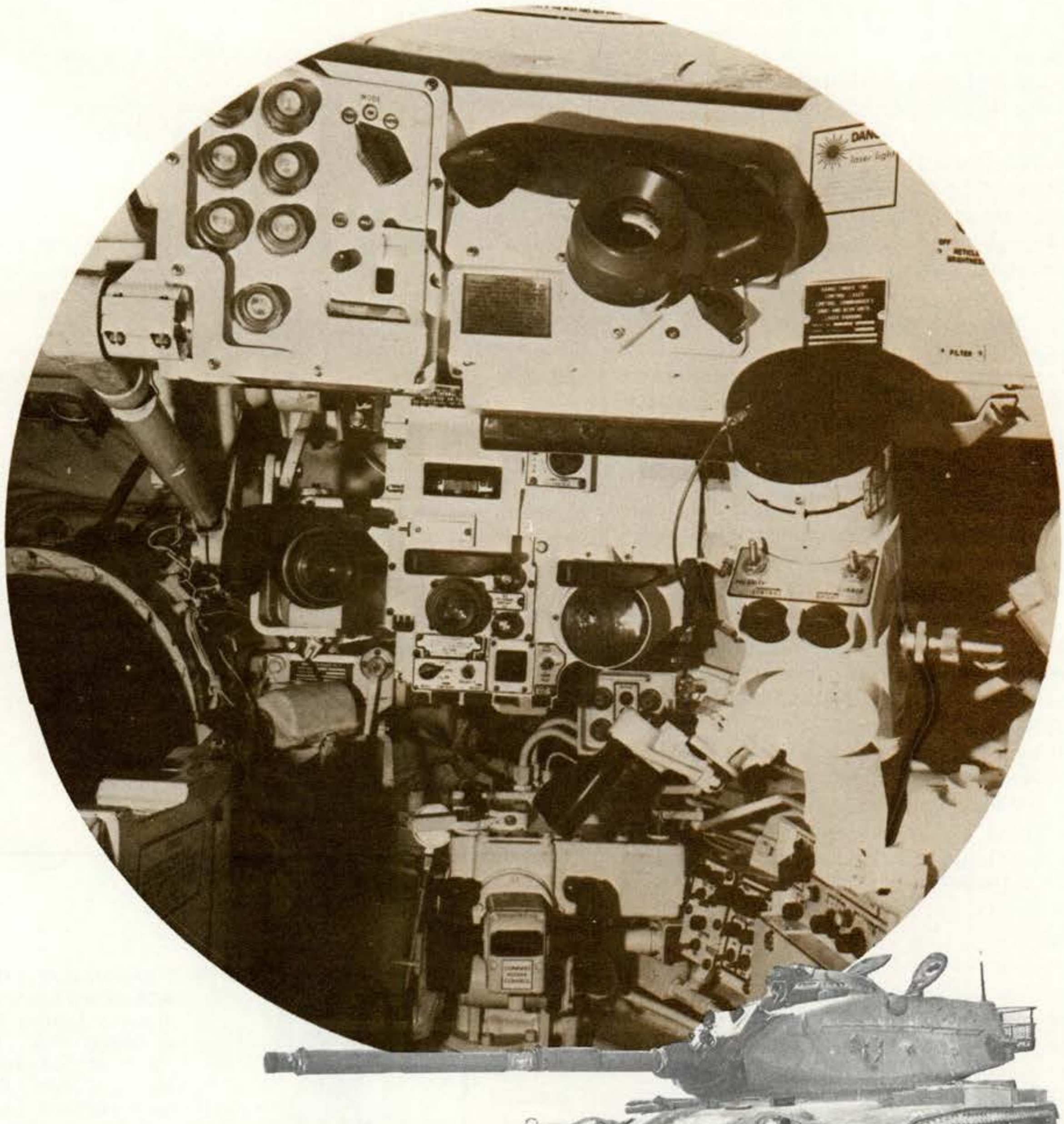
Conducted against the backdrop of President Carter's recent pledge to increase readiness of U.S. forces, the exercise caught the fancy of the international press, who described the 1-66th as the "Mystery Battalion."

This deployment has had a dramatic impact on each soldier's life. We may see it as only an exercise, but as Lieutenant Pena state, 'We must see the entire picture. We'not a mystery battalion; we are very real."

The soldiers, who were genuinely surprised to find that the exercise had been noticed nationally, were proud that their performance had contributed favorably to the military posture of the United States.

The real story of 1-66th Armor is not of some mystery battalion streaking against time to Germany—the real story is encompassed in the sweat, toil, dedication, and emotion of the men of the unit.

SPECIALIST FOUR LEE ROY DEWITT enlisted in the Army in January 1979, and attended the journalist course at the Defense Information School, Fort Benjamin Harrison, Indiana. He has been assigned as a military reporter for the *Fort Hood Sentinel* since July 1979. He traveled to Germany with the 1st Battalion, 66th Armor on Exercise ELIGIBLE RECEIVER II.



Development of Fire Control Equipment

by Captain Michael R. Matheny

Since the first tankers moved across the battlefields of World War I, gunnery has been an essential art to armor soldiers. In fact, the gunner's pride throughout the age of gunpowder has rested on his ability to hit the target. Until the late nineteenth century, this ability was dependent upon the exercise of the gunner's individual skill while peering over open sights. Toward the end of the nineteenth century, technology made available the means to increase greatly the accuracy of artillery and enhance the skill of the gunner. Like the genesis of the tank itself, the origins of tank gunnery are rooted in British naval history.

The first telescopic sight to be directly secured to a naval gun was brought abroad ship by Bradley Fiske of the U. S. Navy in 1892. These telescopic sights magnified the image but were rarely used except for the initial sight picture. The all too familiar problem of recoil and the resultant damage to the gunner's eye did not encourage their use. In 1898, a British naval officer, Sir Perry Scott, remounted the telescope on a sleeve that permitted the gun barrel to recoil without moving the telescope. Despite the obvious advantages of this system, the innovation was not widely accepted for several years. Having learned first hand of Scott's innovation, William Sims of the U. S. Navy waged a bitter fight to have this continuous-aim telescope adopted within his service.[1]

The effectiveness of Scott's idea can be easily seen in a comparison of gunnery results. In 1899, five ships of the North Atlantic Squadron fired at a light ship hulk at 1,600 yards. After banging away for 25 minutes only two hits had been made in the sails of the target ship. Six years later, one naval gunner hit a much smaller target 15 times in 1 minute at the same range—half of them hit a bull's-eye 50-inches square.[2]

The tanks that appeared on the battlefields of World War I were largely the result of high-level support from the British Admiralty, headed by Winston Churchill. The male version of the *Mark I* to *IV* series of tanks with the familiar rhomboidal design was armed with two naval 6-pounder guns. These guns were initially aimed over open sights but later models attempted to incorporate Scott's innovation of the continuous aim telescope. These telescopes provided small magnification and a method for applying superelevation to the gun. Range was estimated and put on a drum on the side of the mounting. This depressed the line-of-sight in relation to the position of the gun so that when the sight was layed on target the gun automatically raised to the necessary superelevation to hit the target.[3]

The photos on the opposite page are of an M-60A3 tank and its primary fire control instruments.

Ernest Swinton, an early pioneer in the development of armor, wrote in his *Notes on the Employment of Tanks* that "the six pounder guns firing at reduced charges will give accurate fire up to a range of 2,000 yards, and they can be fitted with telescopic sights so that full advantage may be taken of a chance of this nature should it occur."[4] One can only guess that as the World War I tankers lurched across the battlefield in a vehicle virtually without suspension that the open sights which were retained for emergencies were used more often than the telescope.

After the war, tank gunnery did not change substantially. Interesting to note is that the British tank gunnery manual of 1930 indicated that firing on the move was considered to be the most common form of engagement. In adhering to the time-honored principle of keeping it simple, the manual described the process of target acquisition as follows:

> (1) The eye tells the brain that the sights are in the correct relation to the target.
> (2) The brain decides to fire.
> (3) An impulse is sent along the nerves to actuate the muscles necessary to move the firing mechanism.
> (4) The muscles move the firing handle the required distance.
> (5) The projectile moves along and out of the bore.[5]

The simplicity of the interwar period quickly faded, however, into the headlong rush to harness technology during World War II. It was this war that really established the tank

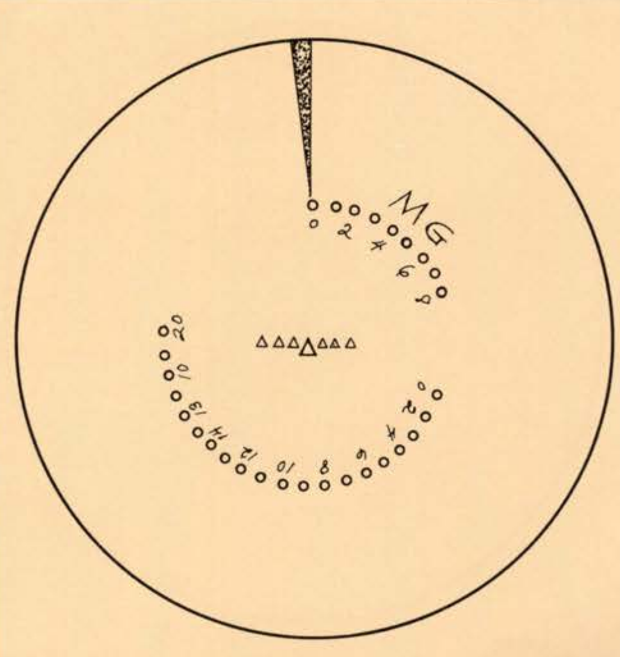


Figure 1

as a predominant member of the combined arms team and set a rapid pace of innovation in tank gunnery. Throughout the war, determining range was a matter of estimation dependent upon the skill and experience of the tank commander. The introduction of the ballistic reticle and reliance on the tank commander's judgement made tank gunnery a matter of adjustment which rarely produced first round hits.

The German system is best illustrated by examining the *Mark IV* tank. Looking through the telescopic sight of the *Mark IV,* the gunner viewed the sight picture in figure 1. The tank commander (TC) estimated the range, and the gunner turned a small range drum mounted beside the telescope. The range drum caused the range scale viewed within the sight to rotate. The rotation of the range scale lowered or raised the aiming point and thus provided the superelevation when the gun was layed on the target. This arrangement was used to some extent in all the German tanks, but interestingly the *Mark IV* also had a bar sight. For shooting on the move, the steel sighting bar was mounted alongside the telescope with a fixed front sight and a hinged rear sight.[6]

U. S. tankers during World War II used ballistic sight reticles also based on range estimation by the tank commander. The gunner on a *Sherman* tank saw the sight picture in figure 2. This is a simple ballistic reticle based on the ammunition type. The TC estimated the range, and the gunner centered the target on the appropriate range line. The later *Shermans* also had vane sights bolted to the turret roof directly in front of the tank commander's hatch. The vane sight provided a fixed front and rear sight to be used by the TC in laying the gun for direction.

The experience of World War II indicated the need for a more accurate method of determining range. Even before the war ended the Germans designed a turret for the *Panther* which was to have had a stereoscopic rangefinder.[7] It was in the United States, however, that the first practical rangefinder for tanks was developed. As early as June of 1945, a board of officers meeting at the Army War College recommended the development of a radar rangefinder for tanks.[8] The Robinett Board established at Fort Knox in 1945 declared that a range determining device would enable the average tank commander to achieve first rounds hits at least 50 percent of the time.[9] The discussion on the type of rangefinder to be developed focused on the stereoscopic and coincidence methods of range determination. After several years of debate and testing, the stereoscopic rangefinder was eventually chosen because the "clarity and quality of the field of view was not impaired by the movement of the target or the firing of the tank."[10]

The *M-47* introduced in 1952, was the first mass-produced U. S. tank to be equipped with a rangefinder. The stereoscopic rangefinder was positioned for use by the gunner. Later in the *M-48* the rangefinder was moved to the tank commander's position to enable the TC to better acquire the target and provide the commander with a direct fire sight. The sight reticle for the stereoscopic rangefinder appeared as depicted in figure 3. The ranging reticle was formed by five vertical lines placed

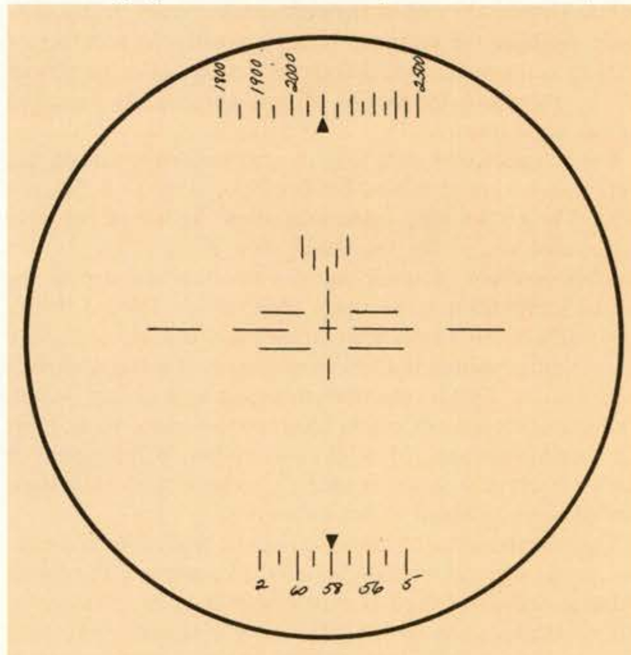


Figure 3

to form a V pattern. When the range knob was rotated, the range reticle would appear to move toward or away from the target. When the apex of the V pattern appeared to be directly over the target, the range was correct. The problems in training and the fact that everyone does not possess depth perception led to the adoption of the coincidence rangefinder in the *M-48A3.*

In other countries, the need for accurate range determination was met with a variety of solutions. The Germans felt that the advantages of the stereoscopic rangefinder outweighed the disadvantages and continue to use it today. The British have experimented with rangefinders but have continually relied on a ranging gun. The ranging gun is a coaxilly mounted machine gun which provides range determination and thus superelevation by simply striking the target. Although admirably simple, the advantages of such a system diminish after 2,000 meters. The Soviets have retained the simplest system of all. The *T-62,* still the backbone of Soviet armor formations, uses a ballistic reticle similar to the patterns used during World War II.

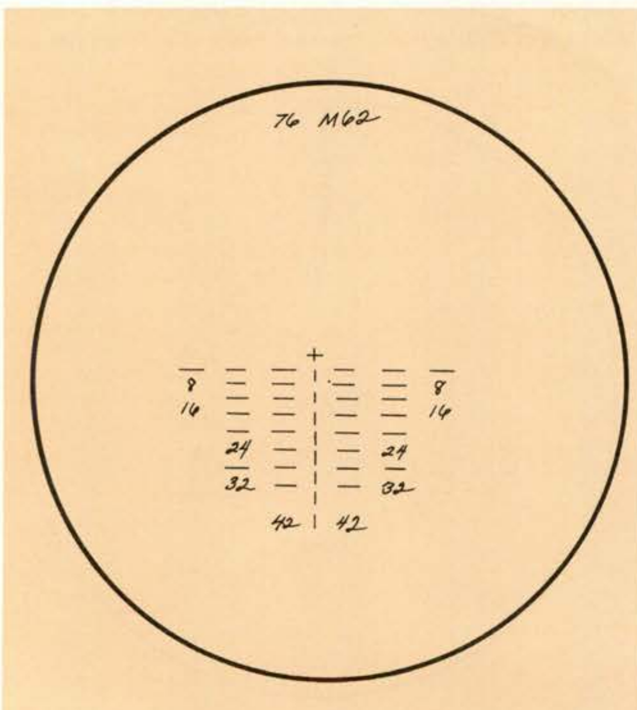


Figure 2

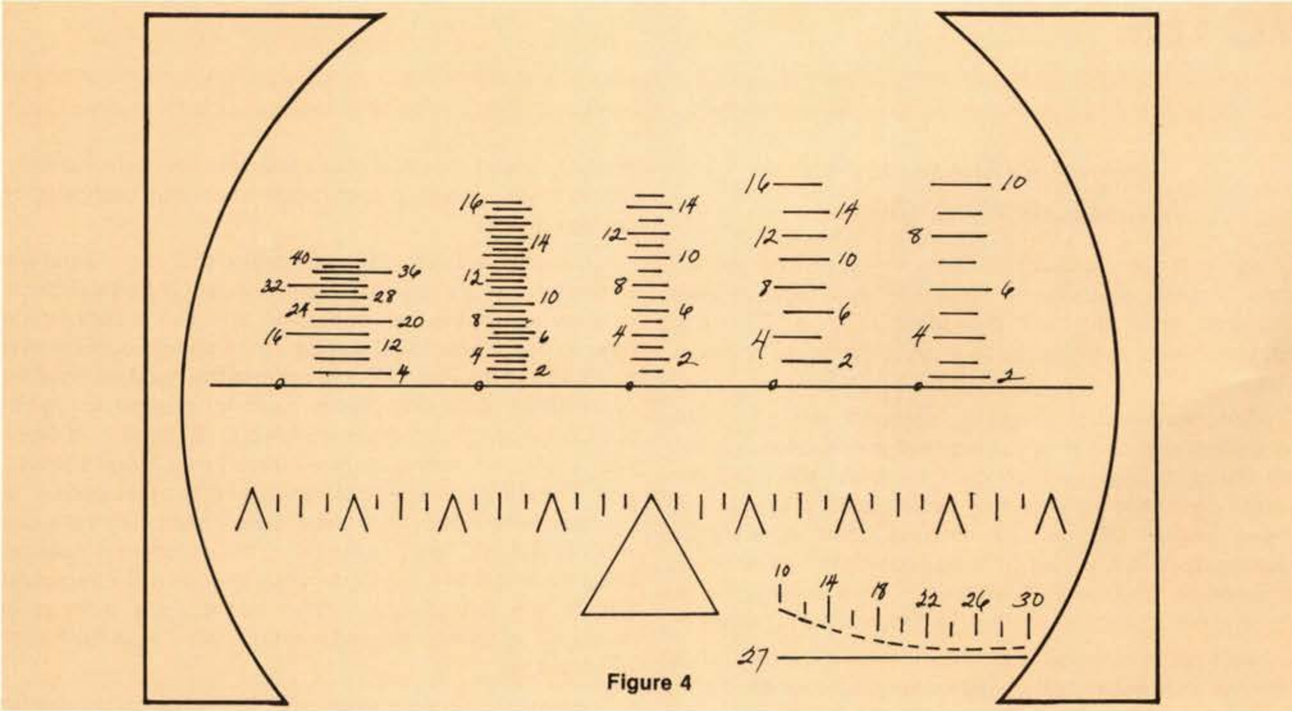


Figure 4

The *T-62* gunner's sight picture is shown in figure 4. Although the gunner can use the stadiametric rangefinder in the lower right corner of the sight picture, range determination is the responsibility of the tank commander. The TC also has a stadiametric rangefinder which is based on a target height of 8.9 feet. Should the target fail to meet those dimensions, the TC must estimate the range or use a variation of the *width over range* x *mils* (WORM) formula. Once the TC announces the range the gunner rotates the range knob on the telescope until the black horizontal range line corresponds to the scale for the ammunition being fired.[11]

With respect to tank gunnery, in almost every case the direction of technology has been in range determination. The necessity of determining the correct angle of superelevation has led to the development of the laser rangefinder and complex computers that can now take into account wind, weather, and a host of other variables. The success of this technological effort can be seen in the rising standards of tank gunnery. In 1950 the *Sherman* tank gunner was required to hit the target within 45 seconds;[12] today FM 17-12 calls for the crew to hit the target at much greater ranges within 15 seconds.

Perhaps the real answer in tank gunnery is not accurately determining the necessary angle of superelevation but eliminating it. It is conceivable that an exceedingly fast round might provide a sufficiently flat trajectory to do away with the need for superelevation for most realistic combat ranges. The problems of training and the need for increasingly expensive and complicated rangefinding equipment might fade away under the overwhelming simplicity of such a system. If the research and development of the past 20 years had been devoted to ammunition rather than range determination, it is difficult to say what the real impact on tank gunnery might have been. It is certain, however, that regardless of the system and the immense advantage that technology can give, as long as men pull the trigger the training and the individual skill of the gunner will continue to be the most important element in tank gunnery.

FOOTNOTES

[1]Elting E. Morison, *Men, Machines and Modern Times,* Cambridge, Mass.: M.I.T. Pres, 1966, p. 22.
[2]Ibid.
[3]The Royal Armored Corps Tank Museum, *1915-1918 The First World War* Bovington Camp, Dorset, 1967, p. 8.
[4]J.F.C. Fuller, *Tanks in the Great War 1914-1918,* London: John Murray, 1920, p 57.
[5]*Tank Gunnery* Vol. II of *Tank Training,* London: His Majesty's Stationary Office, 1930, p 13.
[6]*German PZKW IV Tank, Report on Examination of the Turret and Armament,* Department of Tank Design, Ministry of Supply, October, 1943, p 96.
[7]R. M. Ogorkiewicz, *Design and Development of Fighting Vehicles,* Garden City, N.Y.: Doubleday & Co., Inc., 1968, p 67.
[8]"Report of Board of Officers Convened to Study the Equipment of the Post War Army," Washington, D.C.: Headquarters Army Ground Forces, June 20, 1945, p 8.
[9]1LT Donald E. Pike, "Birth of the Stereoscopic Rangefinder in Today's Tank," 1955, p 1.
[10]Ibid.
[11]*Operator's Manual T-62 Medium Tank,* Co. D, 519th M.I. Bn., p 3-56.
[12]FM 17-12 *Tank Gunnery,* Washington- D.C.: U.S. Government Printing Office, 1950, p 489.

CAPTAIN MICHAEL R. MATHENY was commissioned in Armor upon graduation from the University of Dayton in 1972. He has served as a tank platoon leader and executive officer in Company A, 4-69th Armor in Maintz, Germany. He is a graduate of Wright State University with a MA in History. After completing the Armor Officer Advance Course, CPT Matheny was assigned as the military history instructor at the US Army Armor Center and Fort Knox. He is currently assigned to HHC, 1-64th Armor in Europe.

NOTES

Improved Suspension Withstands Mine Damage

An improved tank suspension developed by the US Army Mobility Equipment Research and Development Command has survived the blast from a 22-pound pressure-fused mine—a force almost twice its previous capacity.

The hardened suspension systems works on the principle of reducing the area exposed to an exploding mine and using stronger components to resist the blast the system does receive. The new design uses a single road wheel instead of the two wheels used in standard suspensions. This wheel rolls on redesigned track shoes with metal links, individual pins, and a steel yoke. In previous tests, it stood up to a 12.6-pound antitank mine.

As a result of those tests, the pin within the track shoe links was improved and the road wheel was toughened with a special outside belting. During the latest series of tests, these improved components were subjected to a 22-pound mine blast and the tank was then driven a short distance forward and backward. The suspension lost seven track shoe bodies and three yokes, but the tank could still be driven.

These new developments could make a life and death difference in future battles. An armored vehicle can be immobilized by an explosive charge as small as 3 pounds. That's all the force it takes to sever the tracks of a conventional suspension. Since minefields are usually covered by artillery and antitank weapons, an immobilized tank is an easy target to destroy. By enabling the vehicle to continue its mission or limp off the battlefield for repairs, the new suspension could save the crew's lives.

The goal is to develop a tank suspension system that can survive the blast from a 25-pound antitank mine, the most powerful mine used by Warsaw Pact forces. More mobility and blast tests will be conducted before the system is turned over to the Tank-Automotive Readiness Command later this year.

Battle Reports

The US Army Training and Doctrine Command publishes an excellent series of TRADOC Bulletins called *Battle Reports*, which contain valuable and current information about Threat weapons, equipment, and tactics, as well as methods for countering same. Information for these *Battle Reports* comes from simulations, field exercises, and intelligence sources and serves to rapidly disseminate specifics concerning how to fight and how to support on the modern battlefield. Twelve issues of the series have been published to date, the most recent one (August 1979) is titled, "Combat Vehicle Engagements." Future issues will discuss Soviet airmobile capabilities TOW gunnery and tactics, terrain reinforcement, electronic combat, Soviet chemical operations and countermeasures, Soviet river crossing operations and other subjects of current interest.

Comments from the field indicate that many units are unaware of or are failing to receive copies of *Battle Reports* as they are published; confusion also exists concerning how to order additional copies. Units should confirm that block 432 of DA Form 12-11b reflects the number of copies of TRADOC Bulletins (*Battle Reports*) desired for initial pinpoint distribution from USAAGPC, Baltimore. *If block 432 is not completed, units will receive no initial distribution.* Pinpoint account holders wishing to order additional copies of the TRADOC Bulletin series must request same from USAAGPC, Baltimore, using Miscellaneous Publications Form 18 and DA Form 4569. Refer to DA Pamphlet 310-3 and DA Circular 310-1 for current indexes of doctrinal, training, organizational, and "How-To-Fight" publications.

A new distribution system for TOE units, scheduled for implementation in 3d quarter, FY 80, may alleviate some current distribution problems. This "PUSH" system will eventually replace the DA Form 12 series system, excepting classified requirements, in TO&E units only. TDA activities are unaffected and will continue to use the present system.

Suggestions for topics for inclusion in the *Battle Report* series may come from any agency or individual, and should be addressed to Commander, TRADOC, ATTN: ATDOC-DDD, Fort Monroe, VA 23651.

Stinger in Production

The first *Stinger* air defense weapon to come off the company's pilot production line has been completed and delivered to the Army. This initial unit and several subsequent rounds will undergo contractor tests at White Sands Missile Range, NM, to make sure production hardware meets Army requirements. Later, the government will fire additional rounds to evaluate missile reliability.

THE GENERAL ADNA R. CHAFFEE COMMEMORATIVE BALD EAGLE

Prints of a commemorative painting titled, "The General Adna R. Chaffee Commemorative Bald Eagle," will be issued by the Cavalry-Armor Foundation in mid-April 1980. Nature artist Charles Frace created the 22½ x 30-inch full-color painting which honors General Chaffee as the "Father of the Armored Force." One thousand signed and numbered prints will be issued. Additional information about the General Chaffee Bald Eagle print is available from the Patton Museum Development Fund, Box L, Fort Knox, KY 40121.

Weighing about 35 pounds, *Stinger* will be an all-arms weapon and will give soldiers and marines immediate air defense against low level aircraft attacking from any direction. *Stinger* will have improved range and maneuverability, significant countermeasures resistance, and a device to identify aircraft.

Prime contractor for *Stinger* is the General Dynamics Corporation.

Training Extension Courses

There are 127 Training Extension Armor Course lessons available for distribution to Armor units, with the total expected to rise to over 200 by the end of the year. Lessons of general interest are also available.

These lessons, prepared by the US Armor Center and Fort Knox, are designed to increase individual and unit proficiency, improve job performance and help prepare for SQTs.

Subjects available or being developed include Armored Vehicle Recognition, *M-60/M-60A1/M-60A3* Target Engagement, Tank Platoon Movement and Fire, Armor Cavalry Platoon Operations, Armor Tactical Operations, and others.

TEC lessons are available from local Learning Centers or MOS Libraries.

Fuel Additive

An additive that prevents fuel breakdown during prolonged storage and improves corrosion resistance in vehicle fuel systems is being field tested by the US Army.

The additive will be used in tanks that have been assembled, but are awaiting final equipment fitting, a process that takes up to 12 months. The *M-60s* will be fully fueled and treated with the additive to minimize corrosion, microbiological growth, and fuel deterioration problems.

Previous user acceptance testing has included using the additive in vehicles awaiting work at rebuild depots and in some of the Prepositioning of Materiel Configured in Unit Sets (POMCUS) equipment stored in Germany.

Armored Unit Reunions

3d AD	Seven Springs Mountain Resort (Near Pittsburgh, PA)	July 23-26
722d Tank Bn	Virginia Beach, VA	Aug. 15-17
749th Tank Bn	Huron, OH	July 27-29
11th ACR	Fort Knox, KY	May 15-17

Does NATO Need the Neutron Bomb?

In April of 1978, President Carter decided to *defer production of the enhanced radiation weapons pending future indications of Soviet restraint ". . .in its conventional and nuclear arms programs and force deployments affecting the security of the United States and Western Europe." At the same time, the President ordered the Defense Department to proceed with modernization of the Lance nuclear warhead and the 8-inch weapon system, leaving open the option of installing the enhanced radiation warheads.* Upon hearing of the President's decision to delay—rather than cancel—the project, Secretary of Defense Harold Brown, a strong backer of the neutron bomb, was pleased because ". . .we're going ahead and modernizing the (delivery) system (a neutron capability could be added) on rather short notice."[1]

As a student in the U.S. Army Command and General Staff College's block of instruction on Soviet Tactics, I became impressed as well as alarmed at the pervasive dependence upon armor in Soviet military doctrine and practice: "Tanks are employed at all echelons, from platoons and companies in direct support of the motorized rifle troops up to formations such as the Tank Army."[2] Indeed, no less a figure than former Soviet Minister of Defense A. A. Grechko has extolled the virtues of Soviet armor in his pamphlet, *On Guard for Peace and the Building of Communism,* in explicit terms: "The tanks are the *main strike force* of the Ground Troops, and are designed to carry out the *most important missions* in the various types of combat actions."[3]

According to the Threats Division, Concepts and Force Design Directorate, Fort Leavenworth, Kansas, the Soviet commitment to armor translates into an estimated 50 tank divisions in the Soviet Army, much of which is presently poised on or near NATO borders. In fact, the Threats Division has even identified three principal likely corridors of attack should hostilities break out:

- The North German Plain aimed at the industrial Ruhr Valley and Dutch ports.
- The Fulda Gap which leads to Bonn, the seat of the West German government, and to the extensive American installations around Frankfort.
- The Hof Corridor pathway to Bavaria and points south.

Since the Soviets anticipate the wide-spread use of nuclear weapons in any future conflicts, they have taken care to design their armor accordingly.

> "The tank provides offensive punch and a shield against the effects of nuclear strikes and possibly complete protection of the crew against contamination. . . . It [the tank] may be used in the first echelon in exploitation of nuclear use or gaps, or in the second echelon in the offensive to exploit breakthrough achieved by the motorized rifle division. . . . Soviet armor can move through chemically or radiologically contaminated areas."[4]

I submit that this is the salient factor in the Soviet threat which makes the immediate deployment of the neutron warhead *compelling.*

Presently, the nuclear weapons in the NATO arsenals which would have to be used to stop this Soviet armored advance are extremely destructive. Since these weapons would most likely have to be used on friendly territory, their use could cause undesirable loss of civilian lives over a wide area adjacent to the armored column target zone.

The neutron warhead, on the other hand, with an explosive force of only one kiloton, restricts the destructive effects of heat and blast to a much smaller radius—less than a mile. Instead, it relies for its principal lethal effect on its enhanced radiation dosage which is uniquely effective against armor:

> "Detonated at an altitude of 3,000 feet, little, if any, of the blast would reach the ground. But the neutrons would flash *through the thickest tank armor,* causing its victims to vomit, lose control of their bodies and die—-quickly or slowly, depending on their distance from ground zero. 'If the dosage is high, an individual will die within minutes from shock' says Samuel Cohen, 57, the California physicist who developed the neutron bomb concept back in 1958 'At lower dosages, an individual might survive several weeks. But even at these lower dosages people can't do very much; radiation sickness is pretty debilitating.'
>
> Nearby civilians and friendly troops, meanwhile, would be safe if they stayed in basements or in bunkers beneath 3 feet of dirt—*a precaution that is not available to tank crews.*"[5]

In view of the overwhelming armored advantage (3 or 4 to 1) of the Soviet/Warsaw Pact forces in the European theatre, it is probable that, should there be a surprise thrust by these forces against the relatively lightly-defended NATO positions, the NATO forces would initially, at least, be pushed back into NATO territory. The Soviets understand this; therefore, they may well view our present tactical nuclear defenses as a *meaningless* deterrent because of the large-scale destruction which their use would necessarily wreak on our own allied population and territory. Indeed, this is precisely the type of devastating political dilemma which the Soviets would delight in forcing upon a U.S. president. (Destroy your ally in order to save him.)

The foregoing is a compelling argument that policy makers in Washington must consider when reevaluating their decision to produce and deploy neutron weapons.

The deployment could change the credibility of the NATO tactical nuclear deterrent and, with it, lessen the likelihood and appeal of future Soviet aggressive tendencies in this area. One of the U.S. Senate's most knowledgeable defense experts is

[1] "Furor Over the Neutron Bomb," *Newsweek,* April 17, 1978, p. 34.
[2] *Military Operations of the Soviet Army.* USAITAD Report No. 14-U-76, 25 May 1976, p. 7.
[3] Grechko, A. A., Reprint in "Soviet Tactics," USAGSC M112-1, Section 1, Lesson 1, p. L1-1-10.
[4] *Handbook on Soviet Ground Forces,* FM 30-40, 30 June 1975, p. 5-9.
[5] "Furor Over the Neutron Bomb," *Newsweek,* April 17, 1978, p. 36.

Senator Sam Nunn of Georgia, an ardent advocate of the neutron weapon. In defending its deployment in Senate debate, he has pointed out:

> "In the neutron bomb, NATO would have a weapon at its disposal that could be used on its own territory without devastating its own population. The neutron bomb would thus raise the nuclear threshold when compared to present-day nuclear weapons, increase the deterrent effect of our current tactical nuclear force, and lessen any temptation the Soviet Union and Warsaw Pact might have in the future to launch an invasion of Western Europe. . . .
>
> Having a more credible deterrent—one that is preceived by our adversaries to be usable when necessary—means that the chances of having to use it are less likely, not more likely."[6]

And, it might be added, in view of the ever-present dangers of escalation in any East-West confrontation (especially nuclear confrontations), the deployment of the neutron option has the added benefit of also making much less likely that ultimate, unthinkable threat—*Armageddon.*

THOMAS J. BLASI
Captain, AG
Senior MOS Instructor
4152d USAR School

[6]"Go Ahead With Neutron Bomb?," *U.S. News & World Report,* July 25, 1977, p. 26.

Suited to Scout

The cavalry fighting vehicle (CFV) currently undergoing operational field testing, has been designated by the Army as the reconnaissance/scout vehicle for armored cavalry and scout platoons through the 1980's. Critics of the vehicle have voiced their concern that the current design of the CFV does not meet the needs of ground scouts. A review of the background and facts supporting the development of the CFV can be used to effectively counter the concerns of the critics.

The CFV program began in 1968 when the Army established the requirement for a unique and dedicated armored reconnaissance/scout vehicle. This effort was directed at correcting the deficiencies in crew protection, firepower, mobility, load space, and night operational capability associated with scout vehicle design since World War II. By 1973, the program had moved into the testing of two prototypes, each designed for a three-man crew and armed with a 20-mm automatic cannon. Shortly after testing began, the program objectives were radically changed based on emerging concepts of the modern battlefield. As a result, the entire Armored Reconnaissance/Scout Vehicle Program was halted.

During the January 1974 Combat Vehicle Program Review, a reappraisal of the threat to U.S. ground forces raised serious questions concerning the development of a dedicated scout vehicle and the ability of such a vehicle to survive on the mid- to high-intensity battlefield. Challenges were received from the Department of the Army and Department of Defense staffs in their effort to trade scout vehicles for armored personnel carriers and tanks. In response to these challenges, a series of studies were conducted by the U.S. Army Armor Center showing the contribution of ground scouts to what was rapidly becoming known as the "central battle." The utility of the scouts was accepted and the challenge withdrawn. However, the studies reached some interesting conclusions which had to be considered in the development of any new scout vehicle.

Conclusions presented by the Cavalry Scout *Ad Hoc* Committee pointed out that:

- A scout vehicle had to provide mobility equal to, or greater than, that of the main body.
- Increased Threat antiarmor capabilities required increased levels of armor protection for the crews.
- Five scouts on a vehicle were needed to meet sustained operational requirements.
- Increased Threat armor required an antitank capability on scout vehicles.
- Night surveillance and fighting capability were mandatory.

It was clear that it would not be cost effective to design a unique vehicle to meet these special requirements. The cost to design and produce a small number of special vehicles did not make that approach practical. A solution to the problem was sought by finding commonality with a vehicle already in the inventory or under development.

The search led to an evaluation of the Mechanized Infantry Combat Vehicle (MICV) being developed by the Infantry Center. Testing showed that the MICV met the requirements of firepower, commonality, mobility, protection, and load-carrying capability; and in September 1976, the two programs were brought together. Since that time, a number of design changes have been applied to the vehicle to meet the special demands of the scouts.

The basic vehicle design intended for a nine-man infantry squad was well suited to accommodate the five-man scout crew. However, a two-man turret was required to replace the original one-man design. A stabilized 25-mm automatic cannon replaced the lighter 20-mm model, and special armor, added to the sides, provided additional protection. Significant changes were applied when updated Threat assessments and a Congressional mandate forced integration of the TOW antitank missile system into the vehicle design. The TOW antitank thermal day/night sight and 25-mm cannon sight were

integrated into a single unit, giving the vehicle commander a true day/night, all-weather surveillance and fighting capability. The only issue that remained was mobility.

As stated earlier, the scout must possess mobility equal to or greater than the main body for which he is scouting. Rapid advances in vehicle suspension design were being applied to the Army's new main battle tank permitting cross-country speeds of 35 to 40 miles per hour and highway speeds of up to 50 miles per hour. Any new scout vehicle would have to meet or exceed those speeds in order to be acceptable. Extensive developmental and operational testing conclusively showed that the CFV would be able to sustain the same cross-country and highway speeds as the new main battle tank. The scouts, mounted in the CFV, would have mobility equal to the main body's.

It should not be surmised from this discussion that the CFV is the perfect scout vehicle; it is not. It is heavy, big, and noisy. These characteristics alone produce debate among its critics far too lengthy to discuss at this time. What should be clear is that, within financial and technological bounds, the CFV meets or exceeds the stated scout vehicle requirements for the 1980's. Protection, firepower, mobility, and surveillance capability designed into the CFV make it a vehicle suited to the scout.

MARC KING
Major, Armor
USAAMC

A Stretched *M-106* for the 4.2-in Mortar

The Infantry Center, Fort Benning, Ga., and the Tank Automotive Command, Warren, Mich., are experimenting with a stretched version of the *M-113A1* that has a sixth road wheel and a hull that is 26½ inches longer. This allows the vehicle to carry nearly 70 cubic feet of additional cargo and the payload is increased to 6,700 lbs.

Automotively, the vehicle is also greatly changed. It uses a turbocharged Detroit Diesel 6V53T engine, which increases the horsepower from 215 to 275. The conventional power train is replaced by the new Allison *X200-3* transmission, which is coupled directly to the engine and final drives. The cooling system has also been improved.[1]

Greater strength in the torsion bars allows more road wheel travel and better cross-country performance. Steering levers are replaced by a steering wheel, which can be adjusted up and down, in and out, to suit the driver.[2]

This vehicle, presently being tested in the ambulance and cargo carrier roles at Fort Benning, would make an excellent carrier for the 4.2-in mortar for several reasons. The present mounting turntable could be used as is because the two vehicles are virtually the same width. Some advantages of this are:

- A large increase in the amount of ammunition carried (40-50 rounds).
- The increase in size would make it a more comfortable vehicle for the crew.
- An even more stable firing platform than the *M-106* provides.

If a war is initiated by the Warsaw Pact, one of their major aims will undoubtably be to disrupt our supply system. This will cause resupply problems for all units. The larger load of ammunition carried by the stretched mortar carrier would reduce the number of times the mortar carrier would have to be resupplied, thus alleviating this problem somewhat. The larger ammo capacity would also permit longer and more sustained operations. Being able to sustain fire and operations for long periods without having to be resupplied is going to be a major consideration in the opening days and nights of a war with the Pact nations, who will try to push us to the breaking point in their opening attacks. In this case, he who can last the longest may just be the winner and this is where the increased ammo load of a stretched *M-106* mortar carrier would have a bearing on the outcome.

The second advantage, crew comfort, is self explanatory. A crew that is comfortable in its vehicle is going to be much more effective than one that is uncomfortable or only marginally comfortable. The present *M-106* with a full crew of five and their ever-present five duffle bags (or more) of *TA-50* and personal gear make for a mighty cramped environment, especially if the vehicle is buttoned up—a condition we can expect in future conflicts. A stretched version of the *M-106A1* would do a lot to alleviate this problem.

The explanation of the third advantage, the stable firing platform, is also simple. The heavier the vehicle, and the more suspension system to absorb the concussion of firing, the more stable the firing platform. The more stable the platform, the more accurate the fire. This is a major consideration to the mortarman and the people he is supporting.

At the lower level, these would all be important advantages to the cavalry troop commanders who employ the 4.2-in mortar in their troops and the battalion commanders of armor battalions who rely on their 4.2 mortar platoon as their most responsive, readily available source of indirect fire.

In summary, this vehicle would increase our indirect firepower at the lowest level where it is most important and all for very little cost and almost no retraining of the crew.

DALE T. EWING
Staff Sergeant
Troop A, 3/12 Cavalry

[1] Product manager M-113/M113A1 Family of Vehicles, *M-113 Family Data Book* 1979, P. 29.
[2] Ibid.

The Active Defense

There appears to be a growing misunderstanding about the active defense, and the term "active" itself probably contributes to the confusion. The practice of maneuvering nervously about the battlefield or "waterbugging" from position to position has found its way down to platoon level. This is not what the active defense is all about.

First, the active defense really is a defense—not just a delay. In any future war, we must make the enemy pay dearly for every foot of ground he gains, and this means we will fight aggressively from each battle position. We will not just fire a few long-range shots and hastily fall back to the next battle position. But holding terrain is only a part of the concept. The overriding consideration is destroying the enemy.

To employ the active defense, we must make a detailed analysis of the terrain, first from the enemy's perspective and then from our own. On the basis of our understanding of the enemy's doctrine, we must visualize how he will enter our defensive area, how he can deploy his forces, and the type of terrain he will need to reach and maintain his desired rate of advance. From this we should be able to identify his most likely avenues of approach.

We then must analyze the terrain from our perspective and select battle positions along the most likely avenues of enemy approach. These positions must afford us the best possible fields of fire, concealment, and protection. Then we must plan to reinforce any existing obstacles to slow the enemy and to canalize his advance so we can engage and destroy him.

Needless to say, we must have a good understanding of the enemy's doctrine, equipment, and organization, and we must be able to visualize the most powerful array of forces he is likely to employ along each of the avenues of approach. We must then tailor our forces so that they will have the best possible chance of destroying targets as they appear. (This process of determining how many targets must be destroyed in a given time and space to defeat the enemy is called "target servicing" by analysts.)

Since the active defense is designed to counter the large tank and motorized infantry forces that we expect the Warsaw Pact countries to field, specific forces in the active defense must be tailored into combined arms formations built around tanks, mechanized infantry, attack helicopters, field artillery, air defense artillery, and other supporting arms. (Other types of infantry are neither equipped nor armed to conduct the active defense but their defense in urban areas or in rough terrain can contribute greatly to the overall success of the defense.)

The active defense does not necessarily imply movement. Ideally, if our initial analysis of the terrain is correct and the enemy uses the avenues of approach that we think he will, we may not need to move. If the enemy does not use those avenues but pushes a major threat through an area where we have not positioned forces, then we will have to shift quickly our combat power to counter the threat.

The fight will begin in the covering force area, where the covering force must fight aggressively to force the enemy to commit his resources and disclose his main effort. Commanders at brigade, division, and corps levels must use every available asset to "see" the battlefield, anticipate the enemy's moves, and have forces in position to stop him.

Lateral Movement

The determined fighting of the covering force can also gain time for us to make any necessary lateral movements in the main battle area. Once this is completed, though, main battle area (MBA) forces should prepare to fight from their positions until they defeat the enemy or until they are forced to move to avoid destruction. It is here that our field training exercises and maneuvers indicate that we have a basic misunderstanding of the active defense—the common pattern is to automatically begin rearward movement with the emphasis on "active" rather than on "defense." Once the battle has been joined, needless movement on or near the forward edge of the battle area (FEBA) will be dangerous. To disengage safely and displace to another battle position may require more suppressive fires and smoke than we need to stay in position and fight. The idea of falling back from position to position in an elaborately planned scheme needlessly exposes us to enemy fire and does not wreak the necessary destruction on the enemy.

We must plan and select positions in depth and to the flanks so that, should our losses become unacceptable,

we can disengage, displace to subsequent positions, and continue fighting. We should also consider displacing to flanking positions as the primary alternative, when it is practicable, in order to reduce our vulnerability to enemy fires while increasing the effectiveness of our defensive fires. Forces moved laterally from other defensive positions can also occupy these preselected positions to thicken the defense at a critical point or to add depth to the positions.

As the defenders, we may incorporate movement in our plans to improve our combat power. For example, initially, we can emplace tanks and TOWs well forward to engage enemy formations at longer ranges and then move them to positions that allow good flanking shots. But such maneuvers require tight control and we should undertake them only when they promise a significant advantage.

Both sides can be expected to use smoke in large quantities on the battlefield. Warsaw Pact doctrine emphasizes varied use of smoke, particularly in support of their offensive operations. We also plan to use smoke in the active defense to mask our movements, to confuse attacking enemy, to confuse and suppress enemy ATGM gunners, and to deny the enemy overwatch and observation of our battle with his lead elements. But smoke on the battlefield is neutral and fickle, and we must be extremely careful in using it. We could easily blind ourselves and mask the enemy with our own smoke if we miscalculated or the wind changed directions.

Using the active defense will mean different things at different levels of command. The platoon's mission will be quite simply to defend. The platoon leader's job will be to use properly the terrain he is assigned to occupy, and to emplace properly and control his weapons and men.

Company Team

The company team commander will be responsible for organizing the defense of his assigned position, planning for and controlling his mortars and TOWs, and employing other elements of the combined arms team that are under his control. He will control the operation of his subordinate platoons, monitor the status of personnel and equipment, and request necessary support from battalion. He will also be responsible for the resupply of his personnel and weapons systems. He will rely on his fire support team (FIST) chief to do the bulk of the planning and calling for fires and to adjust all indirect fire support.

The company team commander must have a good understanding of the battalion's and the brigade's concept of the defense. He should have the latitude to move his unit, in the event he cannot contact his battalion task force commander, to avoid catastrophic losses within his company team or to take advantage of a fleeting opportunity. In the main, however, he will move his company team and occupy battle positions on order of the battalion task force commander.

While the battalion task force commander will also be concerned with terrain and weapon employment, he will be vitally concerned with tactics. He, like the platoon leader and company commander, is a fighter. He cannot affort the luxury of operating out of a TOC located well to the rear where he will be forced to guess what is happening at company level. He must be forward where he can see the battle, control the company teams, and render first-hand reports to his brigade commander.

The battalion task force commander and his staff must make the company team commanders' jobs easier, not more difficult. They must resist the temptation to pass increasing responsibility to company level. For example, attack helicopters should be controlled at battalion level just as they are in any other maneuver force—not passed on to a company team commander. The battalion commander and his staff can also assist by controlling a greater proportion of the force's fire support, smoke, and close air support, and anticipating company level support and resupply requirements.

The battalion task force commander should also have the latitude to move his forces as he sees fit to accomplish his assigned mission. This means that he may have to reposition company teams within his sector, battle area, or battle position to counter an unexpected enemy maneuver.

Brigade Level

The true significance of the active defense starts to appear at brigade level. The brigade commander must have a detailed appreciation of the terrain in his area and in the adjacent areas if he is to understand the "big picture." He must "see" the battlefield in order to organize his forces and control their fight.

He is the first level of command that will normally have the difficult task of strengthening its forces to counter the enemy attack while economizing its forces elsewhere. Economy-of-force elements may well delay in their area of responsibility rather than defend.

The brigade commander may order movements laterally, to the rear, or forward. He may also counterattack. He, his staff, and the subordinate battalion task forces must be prepared to receive additional forces or to move parts of their units to other commands.

The division and corps commanders contribute to the active defense by "seeing" deeper into the enemy's follow-on echelons and by moving forces to counter the enemy. They also generate additional forces in the form of replacement personnel, equipment, and units.

Differences

The basic difference between the active defense and the mobile defense is that in the active defense the preponderance of combat power will be forward and there will be only limited reserves. The mobile defense called for minimum forces forward and for strong, mobile reserves. In the latter, the enemy was to be directed or canalized into predetermined kill zones where he was to be destroyed. The active defense normally will have no reserve at battalion level and only a limited reserve at either brigade or division.

In summary, the active defense is truly a defense, not just a delay in disguise. It assumes that we will be opposed by a larger and more heavily armored enemy force. It is designed to use the terrain to the best advantage, to capitalize on the effectiveness of our weapon systems, and to use efficiently all of our available combat power.

This article by Major General William J. Livsey appeared in the July-August 1979 Infantry.

Getting to Know the Soldier

Two civilian researchers from the U.S. Army Research Institute for the Behavorial Sciences (ARI) joined a infantry company with the 101st Airborne Division (Air Assault) during joint readiness exercise GALLANT EAGLE '79. Living in the field with the company during part of the exercise, the authors observed the officers and enlisted men in some detail. Following are some of their observations.

Since both of us had only recently left academic institutions, the sterotyped image of the soldier that is sometimes perpetuated in such environments still remained in our minds. Our work at the Institute had exposed us to military literature and to interviews and contacts with military personnel that had helped balance this image, but the feeling of distance separating civilian from soldier still remained. Our participation in the exercise let us get to know some of the people who make up the fighting edge of the Army and did more to close the distance between civilian and soldier than any experience either of us can remember.

We were able to hold several informal conversations with the battalion commander and to observe him in action. Both in the field and in garrison, he spent considerable amounts of time looking out for his soldiers and for their professional development. In the course of our observations, he used both conferences and written memoranda to develop the leadership ability of his company commanders and platoon leaders. He showed respect for each individual, regardless of rank. He once said: "If you run into a soldier in a public place and recognize him, but fail to go up, shake his hand, and ask him how he is doing, you are being negligent in your duty as a commander." He not only preached this philosophy, but he practiced it. On several occasions during the exercise, he took time to chat with officers and enlisted personnel alike. This officer was liked and respected by most of the men we talked with.

On the company level, one of us was able to spend most of his time with the company commander. The latter could hardly be said to have an easy job. We were amazed at the variety of tasks this officer was required to perform competently. Many times the company commander did not know the purpose or reason behind a particular mission; he was just told to move to a particular area and set up a defense. Yet in spite of the frustration and stress, this company commander consistently displayed positive interpersonal skills. Despite several provacations, we never saw him become overtly angry with his men. He frequently asked for and took the advice of his platoon leaders and the men in his headquarters. He showed the same courtesy and patience explaining to the two of us a number of platoon leader tasks.

The company's first sergeant also created a strong, favorable impression on us. He frequently stayed up after the rest of us went to bed, preparing reports for battalion. Often, he would leave early in the day to see that the company was supplied with food, water, and ammunition. To our astonishment, he always found his way back no matter how much we had moved our position during the course of the day. The "top," as he was called, seemed able to balance reprimands with humor and a positive manner, while keeping the men "in line." It was obvious that many of the men respected and liked him, both for his vast experience and for his ability to interact with them.

We also had the opportunity to get to know some of the enlisted men fairly well. True, many of them did constantly complain about the quality of Army life. Yet there appeared to be more of a sense of purpose and satisfaction in the field than there was in many of the garrisons we have visited. This job satisfaction seemed to stem from group solidarity under stress, from each person carrying out his special role, and from a recognizable feeling that each person actively contributed to the unit's overall effectiveness.

Of course, the activities of the second lieutenants were of central importance to our mission. One platoon leader impressed upon us the often stressed importance of concern for the men as a first priority. He made sure the men under his command were fed before he would eat. When water was in short supply, those with the lowest rank were supplied first, and the platoon leader was last. The men under his command appeared to be aware of this concern and thus were motivated to work for him. (Some stories we heard suggest that if a platoon leader does not show this concern—if he simply takes care of his own needs—the troops will not work as hard for him. They may even try to find ways to make him look bad.)

The lieutenants also showed an interest in their men in other ways. For example, one lieutenant took time to talk with his troops about some of his experiences as an enlistee before he went to OCS. Another platoon leader combined a good sense of humor with an ability to communicate with the troops at their own level, thus winning their respect and confidence.

Of special interest to us was the relationship between the lieutenants and their noncommissioned officers. From our interviews with both officers and NCOs, we were aware of the difficult judgments a platoon leader had to make in deciding when he should rely on an NCO and when he should personally take control. The officers in our company seemed to know the individual personalities and specialized capabilities of their NCOs well enough to use them effectively without creating friction. In one of these few cases of conflict we saw, it was necessary for a lieutenant to step into the middle of an argument between and NCO and a private. Although the lieutenant supported the NCO in front of the private, he later explained to the NCO how he might have handled the situation better.

Late in the exercise, we had the opportunity to see the effects of forceful, timely reactions to challenging situa-

tions, and how those reactions gave us a greater appreciation of the meaning of leadership in the field. On one occasion, some APCs were heard coming up the opposite side of the road from a lieutenant's position. The lieutenant quickly jumped up and personally led a squad in an attack on the APCs, consequently getting credit for a "kill." This display of enthusiasm in the middle of "battle" undoubtedly helped sustain the troops' morale during periods of drudgery and boredom.

Certain more basic capabilities and skills were also extremely important to the success of the mission. The requirement to change positions frequently made land navigation a critical officer skill. Judging by the troops' complaints when they sometimes suspected they might be lost, it would seem that a lieutenant who cannot find his way will have a great deal of difficulty keeping his soldiers' trust and confidence. Basic hard skills accompanied by excellent physical condition clearly enhanced a lieutenant's ability to maintain the respect and confidence of his men.

From a more "social" standpoint, the majority of the troops and officers we observed were open and friendly to us and to each other. Conflict between troops and their leaders was rare. Neither racial conflict nor drug use appeared to be a problem.

Condensed from an article by Richard S. Wellins and Michael G. Rumsey, in Infantry, July-August 1979.

Air Cavalry Attack Brigade

"I find it completely reasonable that an attack helicopter squadron could be employed on a flank security mission this afternoon, with lots of scouts and not very many attack birds, and tomorrow morning go out in massed attack with a few scouts and lots of attack birds. So it may be that what we need to do is change our doctrinal approach to the way we employ our aviation units, the way we organize for combat, and the operational concept that we use in the employment of our aviation units."[1]

The idea of the dual mission, along with a recognition of such advantages as increased extended-range, attack helicopter firepower and more efficient tactical employment and maintenance guided our thinking toward a Division 86 organization that consolidates all division aviation into a brigade-size force. This exciting organization is called, not surprisingly, the Air Cavalry Attack Brigade, of ACAB. Its mission is to:

- Find, fix, and destroy enemy armor and mechanized forces.
- Provide command, control, and liaison.
- Provide aerial assets to the divarty and the other maneuver brigades.

To perform its mission, several variations of the ACAB are being considered with differing numbers and types of aircraft. Common to each variation, however, is a brigade headquarters, two air cavalry attack squadrons and a combat support aviation battalion.

The air cavalry attack squadrons (ACAS) are the combat elements of the brigade. The two ACASs perform the dual mission of both air cavalry and attack helicopter organizations. The ACAS provides highly responsive antitank firepower for both the heavy and light division. Consisting of a headquarters and service troop and four air cavalry attack troops (ACAT), the ACAS fights using nap-of-the-earth flight techniques, stealth, and fire and maneuver in concert with other members of the combined arms team. The squadrons have their own limited combat support and combat service support capability.

The combat support aviation battalion (CSAB) provides:

- Command, control, and liaison aircraft in general support of the division.
- Field artillery aerial observer aircraft for the DIVARTY.
- Special mission electronic aircraft (electromagnetic and imagery intelligence) in support of division intelligence/target acquisition units.
- Ground and aerial logistic support to all ACAB organizations.
- Aviation intermediate maintenance to all ACAB organizations.

The CSAB consists of a headquarters and headquarters company, command aviation company (CAC), special electronic mission aircraft (SEMA) company, and a transportation aircraft maintenance company (TAMC). The CAC provides the general support (C^3) aircraft for the division and aerial logistical support of the ACAS until the ACAS ground support system becomes operational. The SEMA company provides a significant improvement in both target acquisition and information gathering capability for the division. The "beefed up" TAMC provides the intermediate-level aviation maintenance for all ACAB organizations.

Not only does the ACAB maximize the combat effectiveness of the combined arms team but it also provides an extremely important additional bonus—a career progression for aviation officers similar to that now followed by other combat arms (Armor, both Artilleries and Infantry) officers.

In summary, the ACAB will make better use of limited resources and will provide a unique opportunity to enhance the combat effectiveness of our divisions. Simultaneously, it will establish a much needed viable career pattern for commissioned aviators.

Condensed from an article by Major General James H. Merryman, Commanding General, U.S. Army Aviation Center and Fort Rucker, in the November 1979 issue of Aviation Digest.

[1] General Donn A. Starry, *Aviation Digest*, November 1978.

OPMD

Officer Evaluation Reporting System

The new Officer Evaluation Reporting System is well underway. During the summer of 1979, over 51,000 officers were briefed by teams from MILPERCEN as a part of an Army-wide information/education program to familiarize the officer corps with the new system. (This compares to 14,000 officers briefed in 1972 in conjunction with the implementation of the DA Form 67-7 OER). Considering the magnitude of change associated with the new system, it generally received positive support throughout the Army.

One of the strengths of the new system is its linkage of individual and unit performance objectives and the communication of those objectives to subordinates. This is achieved primarily through the use of the OER Support Form (DA Form 67-8-1) which is designed to increase two-way communications and strengthen the connection between the performance of individuals and the performance of the teams and organizations they serve.

To accomplish this, the new OER system requires the rated officer and rater to *meet and discuss* the rated officer's duty description and major performance objectives within the first 30 days of the rating period. This objective-setting process is not intended to dictate the use of any particular managerial style. Instead, it is designed to be flexible and a function of the situation, the style and personality of the rater, and the experience of the rated officer. Its primary purpose is to serve as a guide for the rated officer's performance during the introductory portion of his assignment.

Although it is suggested that the support form be used as a worksheet during this process, there is no requirement to complete the form. During the rating period, the objectives and duty description should be periodically updated to reflect shifts in emphasis, additional missions, and other changes which are likely to occur. This updating process insures both the rater and the rated officer are aware of the latest performance requirements.

At the end of the rating period, the rated officer is required to complete the support form and submit it to the rating chain to assist them in arriving at their evaluation of his or her perofrmance. In summary, the objective setting process and support form concept are designed to insure that:

- Duty descriptions and major performance objectives are set and discussed at the beginning of the rating period.
- Performance objectives and duty descriptions reflect actual key elements of performance.
- A continuing dialogue exists between the rated officer and rater which provides for appropriate updating of the duty description and major performance objectives.
- The rated officer provides evaluation information to his or her rating chain at the end of the rating period.

Because the new OER system represents the most substantive change in officer evaluation concepts and philosophy since World War II, a comprehensive monitoring and management program has been developed to insure its responsiveness to the needs of the Army. This program is designed to measure the new system's progress in achieving its stated objectives which include dampening inflation, increasing communication, and improving individual and organizational performance.

Input for the program will be provided from a variety of sources including individual officers, career managers, selection boards, major commands, system managers and administrators, and the OER's automated data base. This information will be used to analyze the effectiveness and impact of the new OER system on other Army personnel management systems, mission accomplishment, and professional development. Detailed monitoring will begin immediately and include a series of In-progress Reviews (IPRs) designed to determine the new system's health as well as guide its direction.

Initially, every effort will be made to avoid formal changes to the new OER system. This is particularly important in view of experience with previous evaluation systems which indicates the importance of allowing a new system time to take full effect and settle prior to making adjustments because hasty change has often proved to be more disruptive than beneficial to the system's general health and long-term well-being. Thus, the OER's monitoring and management program is designed to insure that any changes made are both well thought out and in the best interests of the Army.

The following are some frequently asked questions concerning the new OER system. Additional questions and answers will appear in future issues of ***ARMOR.***

Q. Will Part VII of the 67-8 be the sole focus of selection boards and career managers?

A. One of the purposes of the senior rater concept is to increase the role of more senior officers in the evaluation process in order to achieve a greater degree of objectivity. This has been accomplished in the new system through the Senior Rater Profile Report (67-8-2) and Part VII of the 67-8. However, it would be an erroneous assumption to think the rater does not have an important role in the evaluation process. He completes three-fourths of the OER and evaluates not only the rated officer's professional attributes and duty performance but his potential as well. Furthermore, it must be remembered that an individual report or part of a report is not considered in isolation, but is viewed in the context of the officer's entire record.

Q. What is the impact of the senior rater's potential evaluation of the rated officer when:

a. The senior rater has only a small or limited profile?

b. The senior rater is an inflator?

c. The rated officer and senior rater are assigned to an excepted unit?

d. There are differences between the rater's and senior rater's evaluations of the rated officer's performance and/or potential?

A. a. When the profile is small, the capability to determine the senior rater's rating tendencies is very limited. Therefore, in most cases, until the senior rater's profile builds to at least 5, the relative worth of the evaluation in this part of the report will not be clear. Accordingly, boards and managers must put the potential evaluation in perspective with the rest of the report as well as the rated officer's entire record.

b. The senior rater who places all or most officers in the top box is simply not providing credible evaluative information and may be doing the rated officer a disservice. A top box check, in effect, says the rated officer is in the top 1 percent of all officers of the same grade. Therefore, it is extremely unlikely that all of the officers ever rated by a senior rater will always be one in a hundred. This type evaluation merely says to boards and managers that "this officer is the same as all other officers I rate and he is running with the pack." Furthermore, the senior rater who chooses an inflation philosophy severely limits his ability to identify those officers who truly are outstanding performers or "one in a hundred." Therefore, these officers may not get full credit for their performance.

c. Certainly, many officers in a quality or excepted unit may tend to cluster in the upper portion of the 100 officer model. However, some of those officers perform better and have greater potential than others in the same organization. Additionally, the assignment goals of the Quality Distribution Model provide for the assignment of both upper and middle third officers to excepted units. Therefore, it is highly improbable that all officers in any organization are one in a hundred when compared with 100 other officers of the same grade. A senior rater who places all of his people in the top box is simply not supplying DA with credible rating information.

d. It is expected that there may very well be differences between the rater's and senior rater's evaluations. This is due to the different vantage point these individuals have of the rated officer. The senior rater's position and experience provide him with a broad organizational perspective upon which to evaluate an officer's performance and potential. His evaluation is the link between the rater's day-to-day observation of the rated officer's performance and the long-term assessment of the rated officer's potential by selection boards. However, in those instances when it is suspected that a report is illegal, unjust, or otherwise in violation of the regulation, the local commander is charged to conduct an investigation and attach the results to the OER. Additionally, as in past systems, the rated officer may appeal any report believed to be incorrect, inaccurate, or in violation of the regulation.

Q. What safeguards exist to insure the senior rater's profile placed on Part VII of the 67-8 is accurate?

A. There are numerous safeguards to insure the accuracy of not only Part VII but the entire OER. For example, in order for the OER to be accepted at DA, it is key-punched by two operators who must see and punch exactly the same entries. Once in the system, the OER is matched against the masterfiles to insure it matches the name and SSN of both the rated officer and the senior rater. (Failure to match either name or SSN causes the OER to be rejected.) Next, the rating of Part VII of the OER is added to the senior rater's cumulative profile for officers of the same grade as the rated officer. This profile is then printed on a label along with the names and SSNs of the rated officer and the senior rater. The label is then pasted on Part VII of th OER. Additionally, this information is entered into a senior rater audit trail which contains the name, grade, SSN, and rating of every rated officer evaluated by the senior rater as well as the date the report was processed at DA.

Q. Are there any plans to put a "First Year" stamp on the 67-8?

A. A "First Year" stamp was used on the 67-7 because of documented score instability and variance between and within commands. Since the 67-7 measured all officers against an absolute scale of 200 points, the fact that a rating official tended to inflate or discriminate had considerable impact on the rating an officer received. However, it was virtually impossible for selection boards and career managers to determine this tendency from the OER itself. Thus, the need for safeguards. In the new system, however, the senior rater profile *will* provide selection boards with a comparison of a specific rating and the senior rater's general rating tendency. Therefore, this technique will offer protection to officers rated early in the life of the system in the event of later inflation. Even after several years, a selection board will be able to see exactly how the senior rater was evaluating officers as of the day he rated the individual officer. Thus, there is no need for additional safeguards.

Q. Are there any plans to decay the profile?

A. This is a matter which will be considered after the new system has had time to mature and undergo a shakedown cruise. One proposal in this area involves decaying the senior rater's profile (i.e., returning it to zero) after a specified period of time or upon promotion to the next higher grade. However, judgment on this matter will be deferred until such time as the new system has had a chance to mature.

Q. Will the new OER be numerically scored when it arrives at HQDA?

A. No. This is clearly inappropriate in view of the discontinuance of Order of Merit Lists (OMLs). Therefore, there is no intent to quantify either the overall OER or its individual parts. The information contained on the 67-8 OER will be considered by selection board members and career managers according to their individual judgments and in the context of the officer's entire record.

Q. What is the purpose of the Senior Rater Profile Report (SRPR) (67-8-2) and why is it being placed in the senior rater's OMPF? What will it mean to a selection board?

A. In the new system, the responsibility for providing more credible evaluation information to DA rests squarely on the shoulders of the senior rater. Evaluation is one of his most important responsibilities in that it affects the selection of the future leadership of the Army and has a critical impact on the manner in which the Army accomplishes its missions. The extent to which this responsibility is accepted is in itself an indication of performance. Therefore, SRPR will be included with all other pertinent performance information in the senior rater's OMPF.

As in the case with other information in the OMPF, it is impossible to predict how each selection board will use the SRPR. This will be a function of both individual and collective judgment.

EPMD

Armor Branch Directory

LTC John S. Walker
Branch Chief
8055

SGM Raymond L. Knippel
Branch NCOIC and
PD Chief
8071

Mrs. Eleanor Major
Team Chief
8072

Mrs. Henrietta Freeman
E7/E8 Manager
8072

Mrs. Francis Rawlings
E6 Team, CONUS
9080

Mr. Howard Traphagen
E6 Team, Overseas
9080

Ms. Zilpha Pinkney
E1-E5 Team, CONUS
9080

Ms. Diane Miller
E1-E5 Team, Overseas
9192

Professional Development Section

MSG Robert Horrocks
Armor Career Advisor
8071

SFC Fred Brown
Armor Career Advisor
8072

SFC James Ayers, Jr.
Cavalry Career Advisor
9080

Mrs. Velda Fisher
Management Specialist
8071

Commercial Phone	(202)	325-(Appropriate Extension)
AUTOVON		221-(Appropriate Extension)

The Military Personnel Center is located at 2461 Eisenhower Avenue, Alexandria, VA 22331.

Review of Official Military Personnel Files

Maintenance of the Official Military Personnel File (OMPF) on microfiche at U.S. Army Enlisted Records Center has added a new dimension to services available to soldiers desiring to review their official records.

Soldiers no longer have to travel to Fort Benjamin Harrison to review their records. Now, soldiers may obtain a copy of their OPMF free of charge for review at their home station by writing to:

Commander
USAEREC
ATTN: PCRE-RF-I
Fort Benjamin Harrison, IN 46249

All requests must include full name, SSN, written signature of soldier to whom the record pertains, and the address to which the records are to be mailed. Usually, OMPF are mailed within 15 days of receipt of the request.

Soldiers wishing to review their records at Fort Harrison must make an appointment at least 5 working days in advance by calling the 24-hour inquiry service at AUTOVON 699-2657, or commerical (317)-542-2657.

Soldiers who walk in without making an appointment may experience delays. Records in the process of normal updating or being serviced in connection with promotion selection boards may not be readily available on the day of arrival.

Soldiers may update their OMPF either by bringing authorized file material with them to Fort Benjamin Harrison or by mailing such material at any time to:

Commander
USAEREC
ATTN: PCRE-FR-S
Fort Benjamin Harrison, IN 46249

Only those documents authorized for filing in OMPF by AR 640-10 will be microfiched. Documents not authorized for file will not be accepted, or if mailed, will be destroyed. Experience has shown that approximately 15 percent of documents received at USAEREC are not authorized file materials.

Drill Sergeant Duty. A Part of Professional Development

Armor drill sergeants are a select group of noncommissioned officers responsible for developing discipline, motivation, morale, *esprit de corps,* and professionalism in recruit trainees. They teach the skills necessary to become valuable members of today's Army. Since the drill sergeant is the primary representative of the Army during the formative weeks of a soldier's training, it is essential that only the best qualified professional soldiers be assigned these duties.

Drill sergeant duty is considered part of normal career development for all noncommissioned officers. Qualified soldiers are nominated by their branch for drill sergeant duty based on a review of records. Soldiers who qualify are encouraged to volunteer for drill sergeant duty.

Soldiers involuntarily selected by MILPERCEN for drill sergeant training and duty must be in grades E6 or E7. Selection is based on individual qualifications and the demonstrated potential to be appointed to positions of increasing responsibilities. These soldiers must have placed consistently in the upper half of their career management field as demonstrated by their MOS evaluation results and enlisted evaluation reports. These are considered along with physical fitness, education, previous positions, demonstrated leadership ability, and other criteria established by paragraph 11-65, AR 614-200. Once selected, the soldier, as in any DA-directed assignment, does not have the option to decline. He is expected to perform as a drill sergeant in the same outstanding manner that marked his past duty performance.

Volunteers must be serving in either specialist or NCO pay grade E5 through E7. All personnel in grade E5 must meet the following additional qualifications:

- Minimum of 4 years service
- Successful completion of PNCOC and/or BNCOC
- Recommendation for drill sergeant duty by a commander in grade 05.

Volunteer applications are submitted through command channels using DA Form 4187, following procedure 3-34, DA Pamphlet 600-8, and must include the following:

- DA Form 705 (Army Physical Fitness Evaluation Score Card) showing successful completion of basic physical fitness test (BPFT) within last 6 months.
- Statement from medical officer that applicant does not have a history of emotional instability.
- Copy of Da Forms 2 and 2-1.

Soldiers selected for drill sergeant duty will receive 2 years stabilization at an Army training center with the option to request 12 additional months. In addition, they receive:

- Special duty assignment (SDA) pay (1st 6 months $50; 2d 6 months $75; and over 12 months $100).
- Supplemental issue of uniforms which are laundered free.
- Authorization to wear the distinctive drill sergeant hat and badge. The award of the badge becomes permanent after 6 months of successful drill sergeant duty.
- Pride of accomplishment of a difficult and demanding job as a leader and teacher, and having been identified as one of the army's best NCOs.

DA selection boards are given special instructions to consider quality performance as a drill sergeant as particularly indicative of the professional potential of the NCO.

Drill sergeant duty does not result in reclassification of the soldiers selected. Their PMOS is retained and after successful completion of the drill sergeant school, awarded a special qualification identifier of "X".

Normally, a soldier will serve only one tour of drill sergeant duty. However, some outstanding NCOs may be selected for a second tour of drill sergeant duty in a higher pay grade. There will always be an intervening tour of duty in a regular unit.

Personnel may volunteer to return to drill sergeant duty while serving in the same pay grade, provided the soldier has had a minimum of 24 months in a non-drill sergeant position and completes a normal overseas tour.

There is a continuing need for highly qualified personnel to serve in these vital duties at Army training centers.

For more information, soldiers should contact their personnel center or S-3 schools NCO.

BOOKS

THE EAGLE SQUADRONS: YANKS IN THE RAF 1940-1942. by Vern Haughland. Ziff-Davis Flying Books, New York, 1979. $12.95

Between the collapse of France in June 1940 and Pearl Harbor, the United States lived through a peculiar twilight period during which it reluctantly shifted from a policy of isolation from the new World War, to one of active intervention. During this period, a few Americans of diverse origin—would-be adventurers, internationally-connected businessmen and sportsmen, convinced partisans of the Allied cause—dodged around the limits of American neutrality to take an active part in the war. Some of them ended up flying fighters for the British Royal Air Force (RAF). These men became *The Eagle Squdrons: Yanks in the RAF 1940-1942,* the subject of Vern Haugland's book.

Haugland, a World War II war correspondent and for 21 years aviation editor for the Associated Press, has produced a relatively short but readable account of the origins of the three American fighter squadrons in the RAF, complete with some good photos of some of the personalities involved, a map, and a list detailing those in the squadrons who were killed during the war or died thereafter. The book seems to contribute therefore to an understanding of the processes by which the United States reluctantly abandoned isolation and chose to exercise its potential as a world power; the book introduces us to some of the individuals who evaded the roadblocks of official American neutrality (sometimes including the FBI) to make a well-publicized but unofficial American contribution to the war against Nazi Germany.

The book traces the initial effort of some American interventionists—some of them associated with the Lafayette Escadrille of World War I—and introduces a sampling of the men who made their way across Canada, thence to England, and eventually through the red-tape into the cockpits of *Hurricanes* and *Spitfires* over occupied France. The author further provides enough personal accounts, some drawn from unit logbooks, to give us a "taste" of the air action: the routine of training; escorting ocean convoys in all kinds of weather; air combat over France; and by no means least, "relaxation" between missions.

But readable as it is, the book falls a good deal short of what it might have been. Unlike, for example, Colonel Robert L. Scott's *God is My Co-Pilot,* Haugland's book never brings us close enough to the pilots to really get to know them: their motivations, the ways in which they faced up to the dangers of the airwar—and danger there was, for about one out of three of the Eagles never saw the United States again.

Haugland draws almost all his material (although he rarely directly indicates his sources) from anecdotal sources: accounts by the pilots, many of them taken down years after the events took place. The book thus looks at these critical years during which the Axis was at its peak through the narrow and inevitably distorted viewpoints of a handful of pilots. And that is Haugland's fault, for with a modicum of research in archives which are now open he could have placed his anecdotes into the framework of a reliable history, revealing the "big picture" within which the Eagle Squadrons had their meaning.

The book falls short of what it might have been. Still, for those with a taste for airwar stories, and especially for those personally connected with the Eagle Squadrons, this book has something to offer.

JEFFERY GUNSBURG
Professor of History
Virginia Military Institute

U-BOAT WAR by Lothar-Gunther Bucheim. Translated by Gudie Lawawtz, with an essay by Michael Salewski. A. Knopf, Inc., New York, 1978. 205 pages. $17.50.

U-Boat War is magnificient! Like most European war classics—*All Quiet on the Western Front* to *The Forgotten Soldier—U-Boat War* is antiwar in tone but much more than an account. It is written from the inside out. The smell of oil, diesel fuel, and sweat; the tension of the attack; the anxious anticipation of death during a depth-charge attack; the repugnant stench of one's own body after weeks of bathless existence. The reader is crammed between a confusion of pipes, cables, vents, weapons, intricate machinery and superhuman nerve. Buchheim makes you a crew member of *U-96!*

This book is so well done it is almost like watching a movie. Buchheim's camera captures the moment-by-moment life of German World War II; he became caught up in what he saw and he photographed constantly, inside and outside the submarine, above and below the surface, Buchheim's photos are pure art.

The crew of *U-96,* a *VII-C* class submarine launched in September 1940 and sunk in March 1945 is the author's main character; except for the brief but gripping period of time he served aboard the *U-309* in July 1944.

U-Boat War is also a photo history of fighting men, in all manners and moods; the early human-interest photographs of the young sailors as they sail off to war and the marked contrast when they returned and the almost obstinate tranquillity of the U-Boat commander calmly leaning against the periscope during a teeth-jarring depth-charge attack. Buchheim captures it all. The most riveting photos, however, are those taken from *U-309* off the cost of La Pallice, France, when a sister submarine, *U-981,* was sunk by mines and air bombardment. The sailors at the guns down a British *Mosquito* bomber, men scramble to pull survivors from the sea, the surviving crewmen huddle on the deck of *U-309* placing it in greater jeopardy because it can no longer submerge. All the emotion is right before your eyes with a narrative as colorful as the sea itself.

Of special interest was the German policy concerning shipwreck victims of German U-Boat attacks. Survivors were to be ignored. There was no room on a U-Boat for prisoners and the shooting of disaster victims was forbidden, not so much on moral grounds but on morale grounds. U-Boat attack victims had enough to worry about and matters were not to be complicated by the thought that one was about to be shot while bobbing around in the ocean; and besides, every member of a U-Boat crew was haunted by the idea that someday he would more likely would be in the very same predicament.

Michael Salewski, a distinguished German historian, ends the book with his own essay on the German naval war. A diagram of a *VII-C* type U-Boat is also helpfully included. The large format only helps to bring the photos to life.

Just why the pages are not numbered is beyond me; but it will make little difference to the reader. This book is enough to lift the most cynical armchair adventurer into the conning tower. *U-Boat War* is an underseas classic!

WILLIAM M. BROOKS
650th Transportation Co. (TT)
USAR

BRINGING UP THE REAR: THE MEMOIRS OF S.L.A. MARSHALL, by Cate Marshall. Presidio Press, Edison, N.Y. 1979. $12.95,

This book does two things that all memoirs should, but usually don't. First it provides glimpses of a truly interesting life; and second it offers insight on subjects of interest to the reader.

S.L.A. "SLAM" Marshall, the noted journalist, author, and military analyst, lived a fascinating life. He was born at the beginning of the century and lived to participate in nearly every significant military event of the next 75 years.

He dropped out of high school to enlist in the Army during World War I, finishing the war as the youngest commissioned officer in the AEF. He spent the 20's and 30's out of uniform developing his skills as a military analyst by reporting on Latin American revolutions. Back in uniform, he covered World War II as a historian from the decks of destroyers, foxholes, and the turrets of tanks. After WW II, SLAM was in and out of uniform so many times for so many reasons that his careers actually merged. He went to Korea, Israel, Lebanon, and Vietnam. And each experience resulted in a broader understanding of these events and their impact on our world.

He went all over the world and had a behind-the-scenes view of political and military events and the men who made them. But it wasn't all work either. When he wasn't working with men like Eisenhower, George Marshall, or Ridgeway, he was liberating Paris with Ernest Hemingway or visiting with Carl Sandburg. S.L.A. Marshall led one of those charmed lives.

Bringing Up The Rear is not a rehash of General Marshall's earlier works. In fact, there is little actual combat reporting. What this book provides are dozens of interesting or amusing anecdotes involving famous, infamous, and ordinary people as well as some stimulating thoughts on the effects of fear and fatigue on soldiers. S.L.A. Marshall enjoyed his life and reading his memoirs was enjoyable too.

L. ERICK OHLSSON
Major
MILPERCEN

THE CHANGING WORLD OF THE AMERICAN MILITARY, edited by Franklin D. Margiotta, Westview Press, 1978. 488 pages.

In this age of rapid sociological and technological change, it is natural for an individual to evaluate occasionally his personal and professional relationship to other elements of society. This is particularly true of the professional soldier, who faces constant demands for increased technical skill while perceiving decreased acceptance and support from the general public.

The Changing World of the American Military, composed of 25 essays, aids in this assessment by clarifying some areas of concern facing military professionals, documenting major influences on today's Armed Forces, and raising serious questions for the future. This is a direct result of a conference held by the Inter-University Seminar of Armed Forces and Society in October 1976, which brought together civilian and military scholars for a free exchange of ideas and perceptions concerning the direction of the American military in the next decade. These diverse points of view have been compiled by Colonel Margiotta, who also served as conference chairman.

The book begins with the military's concern over its interaction with society, and the effects that interaction has had on the military's self-perception. It examines the effect of foreign policy on the role of the military, as well as the constraints implemented by an increasing number of domestic considerations. Changes within the profession itself are addressed, both those resulting from external sociological developments and those spawned by internal evolution necessitated by increased technology and new organizational approaches. There are highly detailed studies isolating predictors of success at the service academies and discussions of organizational changes that have affected the academies and their cadets.

In his overview, Colonel Margiotta zeroes in on the fundamental issues raised in each chapter, and he offers thought provoking comment and definitive recommendations for further research. He clearly perceives adaption as necessary for evolution, and evolution as necessary for survival.

The essays are well documented, overwhelmingly so at times, and the bibliography is extensive. While each reader will find views with which he violently disagrees as well as those with which he concurs, the book as a whole provides access to a body of thought which the serious student of military professionalism cannot afford to ignore.

Linda N. Andrews
Fort Hood, Texas

DRESS GRAY by Lucian K. Truscott IV. Doubleday & Company, Inc. Garden City, New York. 1979. 489 pages. $10.95.

"Dress Gray" is a novel about the murder of a homosexual West Point Cadet. The story line is used as a vehicle to explore several other themes.

The reader initially becomes aware of the insights being offered into the unique characteristics and activities of the Military Academy at West Point. Truscott works a thorough description into this novel. Beast Barracks, June Week, Reorgy Week, Camp Buckner, First Class Weekends, the Honor Code, and the Recruiting Program are all included. Spouting plebe poop, "wives," and the "2-1 happy" tactical officer are other examples which graduates in particular, would quickly recall.

The reader also becomes aware of the subtle development of two additional themes as the story unfolds: the pitfalls of Army "Careerism" and the conflict of the individual with the "Establishment." The individual is Cadet Ry Slaight, the central character in the novel. The story opens with Slaight learning of the murder while "walking the area," the Academy's method of punishing the more serious infractions of Academy regulations. Slaight personifies the average cadet. His character is deftly fleshed out to give him a slightly antiestablishment cast during this opening passage. The novel focuses on Slaight's efforts to uncover why the cadet was murdered and who perpetrated the murder. However, the "Establishment," represented primarily by the Commandant of Cadets, desires to suppress the facts pertaining to the murder. Army "Careerism," conflict with the "Establishment," and the novel's main theme—the delicate process of developing and using the strength that the knowledge of power provides—all surfaced during the battle between Slaight and the Commandant. The Commandant's power over officer and cadet alike becomes obvious as the story develops. Using what West Point has taught him and the help of a Sergeant Major, a doctor, and a lawyer, Cadet Slaight fights to overcome the pressures placed on him by the system.

This reviewer found the story itself to be unimportant. The strength of the

novel lies in Truscott's exploration and development of the concurrent themes. His portrayal of life at West Point is the strongest part of his novel. It will stick with the reader long after the thoughts he projected with his other themes.

Jeffery A. Larson
Lieutenant Colonel
3d Bn, 33rd Armor

A SOLDIER FROM TEXAS, by Colonel Cecil E. Roberts, Branch-Smith Inc., 210 pages, $12.50.

A Soldier From Texas is the autobiography of a professional United States Army officer retired after over 25 years of active service.

Colonel Roberts devotes the first portion of his work describing his youth in Texas during the years of the depression. His economic situation and personal desires aroused an early interest in the military. Commissioned in the Infantry, Second Lieutenant Roberts was called to active duty early in 1941. Colonel Roberts prepared for his part in World War II with the young and rapidly enlarging Armored Forces.

The author's initial combat experience came during the Battle of the Bulge while serving with the 14th Tank Battalion, 9th Armored Division. As the operations officer for the 14th Tank, Colonel Roberts played an instrumental role in the capture of the bridge at Remagen.

The author spent the early postwar years at the U.S. Army Armor School, Fort Knox, Ky. A subsequent armor assignment included command of the 4th Tank Battalion, 1st Armored Division.

Of particular interest to the reader will be Colonel Roberts' extensive service with the military attache system. A graduate of the Strategic Intelligence School, his tours as an attache included Greece, 1949-1952, and Bolivia, 1957-1959. Colonel Roberts close association with foreign officers and political leaders offers insight to a side of military life few Army officers have the opportunity to experience.

Following retirement in 1966, Colonel Roberts served as the technical advisor for the film "The Bridge at Remagen." While on location in Czechoslovakia, tense moments occurred when the author and his wife found themselves surrounded by Soviet tanks and infantry during the 1968 Russian invasion.

The author uses humor and candidness in recounting the many highlights and few disappointments of his career. *A Soldier From Texas* makes for most informative and entertaining reading.

ROGER F. MURTIE
First Lieutenant
Co B, 1st Bn, 70th Armor

WEAPONS OF THE THIRD REICH by Terry Gander and Peter Chamberlain. Doubleday and Company, Inc., Garden City, New York. 1979. $25.00

The German military machine of World War II was an enormously powerful conglomerate of modern technology and pertinent application of that technology's products. In no other volume of past or recent publication can this power, this "mailed fist," be more plainly seen than in *"Weapons of the Third Reich."* Messrs. Gander and Chamberlain have done a superb job of gathering information on the German weapons industry from over 140 "official" sources and numerous other "unofficial" ones. Their efforts have culminated in an encyclopedic work which breaks down German military hardware into 29 categories, ranging from personal weapons such as hand grenades and pistols through demolition charges and heavy artillery. The only major classification omitted is that one covering tanks and other armored vehicles. These vehicles are mentioned only when related to a weapons catagory being discussed. Presumably, this classification was left out of the subject volume because there are enough works covering German tanks, armored cars, etc., in print already.

The information that is included, however, is well researched, presented in a most readable format and fills a large gap in the body of knowledge concerning the combat operations of *Wehrmacht, Kriegsmarien,* and *Waffen SS* formations on all fronts. Each catagory of weapons is discussed from a historical perspective with references to experimental and unsuccessful versions as well as the production devices that found their way into the hands of the combat troops. The survey also includes captured weapons in every catagory that were used by German troops to supplement domestic production types. The weapons are examined individually, usually with a photograph or photographs accompanying the details to outline differences and interesting features. The weapons historian or interested observer will find great value in this organizational approach as the individual rifle, rocket, or antitank gun is displayed and scrutinized with an eye toward usefulness, durability, and ease of operation. The authors have also explained, in detail, at the beginning of each classification, the historical background and lineage of each weapon's type. The so-called "V-weapons" are a good example of how this background study is brought out and used to put each weapon classification into prespective.

A major threat that emerges, as one studies the place of various weapons in the entire military-industrial picture, is the total lack of preparedness exhibited by both German industry and the military planners when it came to a "long-war scenario" as opposed to one for a "short-war." Germany was not industrially geared to fight on such a scale as eventually she was forced to fight. This short-sighted planning was underlined by the large-scale German use of captured weapons, ranging from pistols to heavy-caliber coastal defense weapons. The authors graphically point out this weakness with figures and text, and one wonders how Germany did as well as she did up through December 1942.

In conclusion, the work is a sound investment for any library, and will be consulted heavily in the future by professional historians, students of the German military, and laymen on a worldwide basis.

ROBERT P. ARNOLDT
Oak Park, Ill

SHERMAN IN ACTION, by Bruce Culver, illustrated by Don Greer. Pamphlet 2016, Squadron/Signal Publications, Inc., 3461 E. Ten Mile Road, Warren, Michigan 48091.

This is a 50-page pamphlet packed with information, illustrations, scale drawings, but mostly US Army photographs of the *M-4* tank and tankers in action.

It covers as much as can be covered in this size publication the infinite varieties of the *M-4* and the reasons for such variety. Tankers' uniforms are also covered. Some of the variations are quite educational and might be a guide for similar alterations today under certain conditions. Page 13 has a perfect example of why a white star should not be painted on the side.

On page 28 is a photo of an *M-7* 105-mm self-propelled howitzer which obviously had been in a direct fire fight before the tanks arrived as shown by evidence laying on the ground. Page 31 shows a caisson which *M-7s*, and occassionally *M-4s*, towed.

This book has an exceedingly high interest and information to cost ratio. Highly recommended. (It is available direct from the publishers.)

RALPH R. BALESTRIERI
First Lieutenant AUS (Retired)

WAR STORY by Jim Morris. Sycamore Island Book. Boulder, Colo. 1978. 350 pages. $12.95.

Jim Morris has presented a new and refreshing look into the US Army's Special Forces (SF) activities in Vietnam. In *War Story,* Morris is not concerned with the overall struggle, but more with his own personal experiences. Morris' experience spans the time frame of 1963 through 1968.

During his first tour, the then Captain Morris, served in the Central Highlands of Vietnam where he was first introduced to the Montagnards. It becomes very evident that this meeting resulted in a deep abiding love and respect for these fierce fighting people. During his three tours Morris re-introduces to the reader the familiar names of Cheo Reo, Buon Beng Special Forces Camp, Ankhe, Pleiku Special Forces Camp, Kham Duc Special Forces Camp, Ban Me Thuot, and other SF camps and towns in the Central Highlands. Through his special relationships with the Montagnards in 1963, Morris and other members of his SF Camp were able to develop a tough fighting force in the Cheo Reo area which the Viet Cong highly respected and avoided fighting.

War Story establishes the early years of involvement in Vietnam. It is Morris' opinion that had the SF been allowed to fight the VC with the Montagnards and use the VC tactics of guerrilla warfare that the fighting may not have lasted as long as it did.

Morris speaks highly of those he fought with, both US, Australian, and Montagnard.

Morris points out that all was not well with the Montagnards and Vietnamese. The Vietnamese looked down on the Montagnards and attempted to treat them as second-class citizens. The end result was distrust by both and finally the ill-fated Folro rebellion. Though very small, this rebellion had a tremendous impact on the Vietnamese in the Central Highlands.

The most exciting events in the book are the Bu Prang operations during his third tour and the Tet offensive of 1968 in Nha Trang.

The author has written a book in which the reader can see that Morris has a deep love for the Central Highlands of Vietnam and the Montagnards who live there.

Morris is an excellent writer, but Sycamore Press has done this man an injustice by not properly proofreading their type. Other than these typing errors by the publisher, the world has discovered a vibrant and dramatic writer.

RONNIE NALL
Major
USAARMC

Information concerning the availability of professional books may be obtained from the U.S. Armor Association, P.O. Box 0, Fort Knox, KY 40121.

Recognition Quiz Answers

1) SOVIET *T-54* (100-mm main gun, absence of bore evacuator identifies vehicle as early 1950's version. Vehicle equipped with 12.7-mm AA gun and 7.62-mm coax. This version of vehicle also had 7.62-mm Bow gun operated by driver.)
2) SOVIET *T-64* (125-mm main gun, four support rollers, searchlight located on left side of main gun. Storage box's on left side of turret, snorkel stored rear portion of turret. Vehicle equipped with newly designed 12.7-mm AA gun and 7.62-mm coax.)
3) GERMAN *GEPARD (FLAKPANZER B* version) (Twin 35-mm AA Guns. Turret fitted to *Leopard 1* Chassis can be used in both air defense and ground support role. Has stabilized optical sights that can work with or independent of radar.)
4) *SHIR* IRAN 2 (British Produced) (120-mm main gun, 0.5 inch ranging gun, 7.62-mm coax and A.A. guns. Vehicle equipped with special (Chobham) armor for increased survivability. Vehicle also equipped with fully intergrated fire controls and laser rangefinder.)
5) FRENCH *AMX 30SA* (Twin 30-mm AA Guns, turret (TG 130A) fitted to *AMX 30* chassis. Can be used in both air defense and ground support role. Vehicle equipped with electro-hydraulic remote control aiming components.)
6) BRITISH *CENTURION* (no longer used within British forces, widely used in Middle East countries) (Photo of *MK 3* model with 20-pdr gun, vehicle has been ungraded with 105-mm main gun, 12.7-mm ranging gun, 7.62-mm coax and AA machine guns. Inproved (diesel) engine and added armor protection with IR sighting system on latest *MK 13* model.

(This Recognition Quiz prepared by SFC Chris M. Pruitt, Senior Instructor, Master Gunner's Branch, USAARMC

☆U.S Government Printing Office: 1980—657-127/6

THE ARMOR DESK

Recent world events have brought to mind the critical importance of Army Chief of Staff General Edward C. Meyer's recent statement that "Our military forces must provide a decisive war fighting capability. We must focus on preparing for the first month of the next war...first."

One would hope that the "first month" never comes. But the challenge to our leaders, officers and NCOs, is to train a force that stands ready to fight and win on the "Integrated Battlefield."

Recently, training has too often been directed towards preparing the Army for how it "would like to fight rather than how it may have to fight."

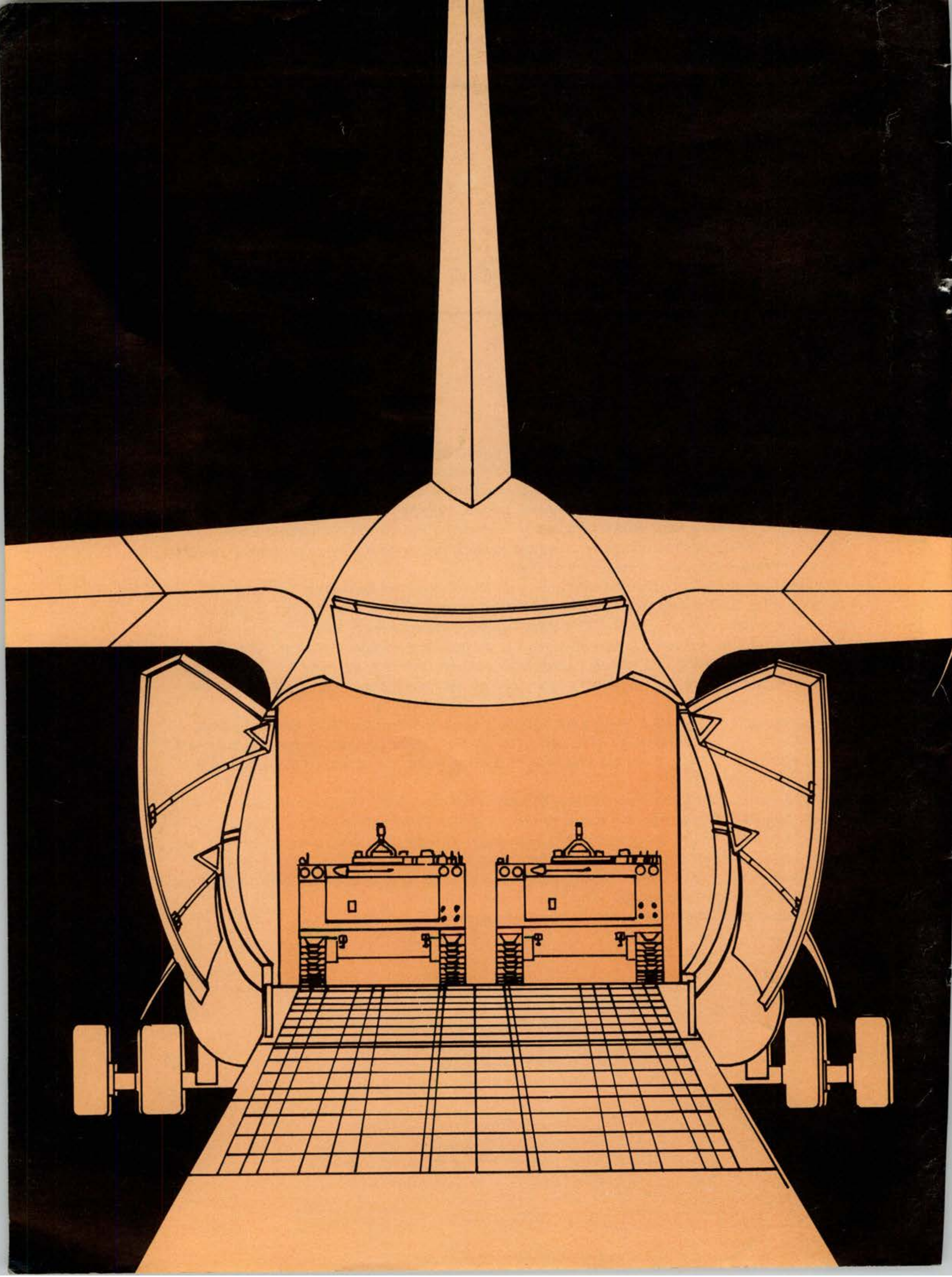
We must direct our attention toward fighting on the "Integrated Battlefield." A battlefield where we must be prepared from the start to defend against all weapons systems, chemical, nuclear, and conventional. The fact that these weapons are on the battlefield, regardless of whether or not they are used, is reason enough to be prepared to defend against them. Our leaders must, as we once did, train our soldiers to perform their required skills just as effectively on the chemical and nuclear battlefield as they can on the conventional battlefield. Today, can they?

Within the past few months, two of our country's most outstanding World War II generals, Jacob Devers and Ernest Harmon, have passed away. Both these combat leaders had the vision to train their units to defend against all weapons systems—one of the keys to the success of their units in battle.

ARMOR *will do its part, but your help is needed. With more than 50 articles in* **ARMOR'***s files awaiting publication, only two are related to the nuclear and chemical battlefield. That in itself is an indicator of the lack of thought that has been given recently to combat, combat support, and combat service support on the "Integrated Battlefield."*

Now is the time to insure that training programs are designed to prepare our units to fight and win on the "Integrated Battlefield." The "first month" is too late!

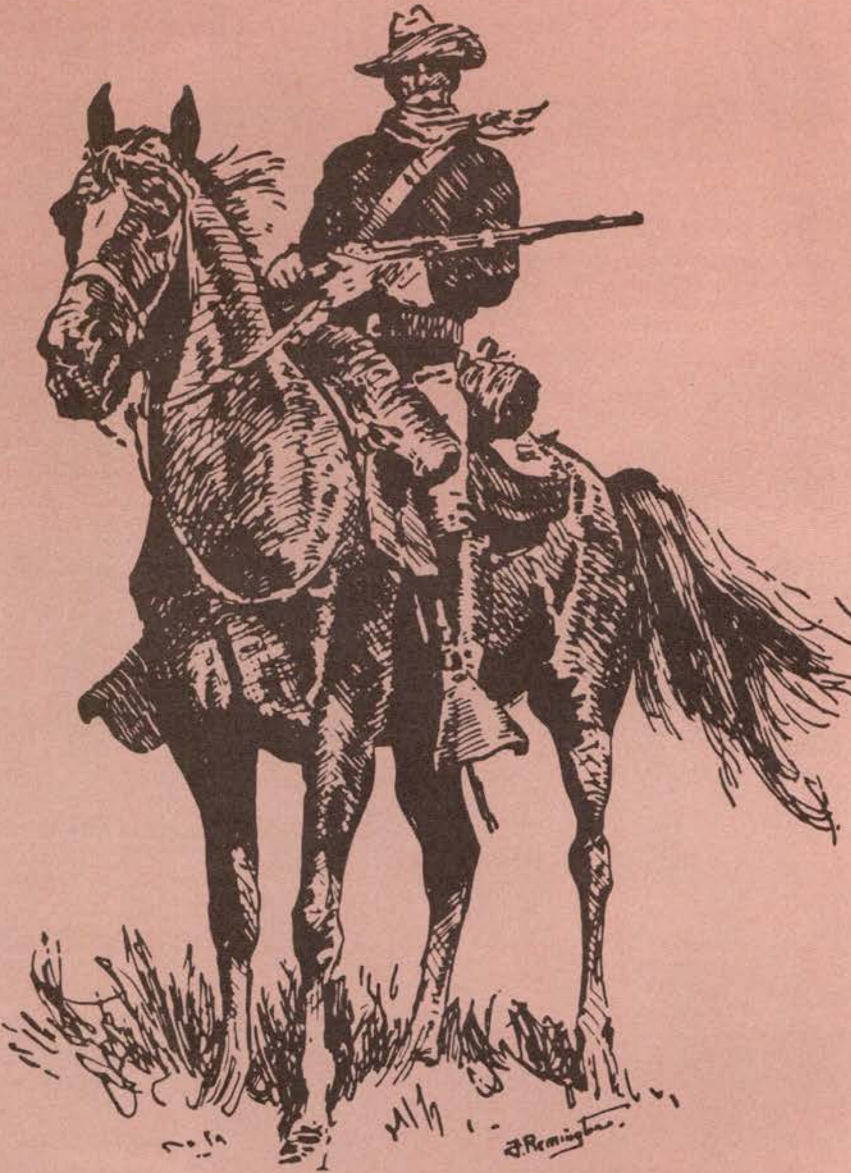
I look forward to seeing you at the Armor Conference.



may-june 1980

ARMOR

US ARMY ARMOR CENTER and FORT KNOX



"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare; to promote professional improvement of the Armor Community; and to preserve and foster the spirit, the traditions, and the solidarity of Armor in the Army of the United States."

MAY-JUNE
Vol. LXXXIX, No.3

ARMOR the Magazine of Mobile Warfare

Editor-in-Chief
LTC FREDERICK W. SHIRLEY

Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
JEANNIE BRIGHT

ARMOR Magazine is published bimonthly by the U.S. Army Armor Center and Fort Knox at 4401 Vine Grove Road, Fort Knox, Kentucky 40121, to stimulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters. Unless otherwise stated, material does not represent official policy, thinking, or endorsement by any agency of the U.S. Army. Use of funds for the printing of this publication have been approved by the Department of the Army, 23 February 1979.

SUBSCRIPTION RATES: Individual subscriptions to **ARMOR** are available through the U.S. Armor Association, Post Office Box 0, Fort Knox, Kentucky 40121. **Domestic:** $8.00 one year, $15.00 two years, $22.00 three years. **Foreign:** $10.00 one year, $18.00 two years, $26.00 three years. Single copies, $1.50.

CORRESPONDENCE: Address all correspondence to U.S. Army Armor Center and Fort Knox, ATTN: ATZK-MAG, Fort Knox, Kentucky 40121. (Telephone: AUTOVON 464-2249 or commercial (502) 624-2249.)

POSTMASTER: Controlled circulation postage paid at Indianapolis, Indiana, Department of the Army, DOD 314.

ARMOR may be forwarded to military personnel whose change of address is caused by official orders (except to APO addresses) without payment of additional postage. The subscriber must notify the postmaster.
USPS 464-510

COVER

" . . . It is not the number of soldiers, but their will to win, which decides battles," says Major General T. S. Hart, Chief of the British Army's Medical Service. His article, beginning on page 30, contains thoughts regarding morale and conduct in battle that are pertinent to soldiers of all ranks, whatever their Army.

LETTERS

Talking *ARMOR*

Dear Sir:

I have been an avid reader of ***ARMOR*** Magazine for many years and have recently become a member of U.S. Armor Association. My father also enjoys your magazine very much but cannot read it himself due to being wounded in the Korean War. My brothers and I have always read it to him, however, we are all on active duty and not at home very often.

We would like to give Dad a membership in the Armor Association since he is a retired regular army officer and was one of the last year groups to be commissioned in Cavalry. He still takes a lively interest in the Army and especially in Armor as three of us are Armor officers; the fourth one is on the way.

This does pose a problem as Dad is blind as result of his wounds, therefore would not be able to read ***ARMOR*** Magazine. We would appreciate it very much if the Armor Association could provide ***ARMOR*** Magazine in record or cassette recording form. Several organizations provide assistance and advice in this area including the Veterans Administration, the Blind Veterans Association, and the Library of Congress thru the Talking Books Program.

If you can be assistance to us in solving this problem, we would all appreciate it very much.

WILLIAM R. BIERWIRTH
First Lieutenant, Armor

*Editor's note. Although the U.S. Armor Association does not have the facilities for recording **ARMOR,** the Talking Book Library in Louisville, KY and other major cities will record the magazine free for the blind. Readers who are interested in obtaining this service should contact their local Talking Book Library or the editor of **ARMOR** for details of the program.*

The San Diego Device

Dear Sir:

The recent article in the "Master Gunner's Corner" on the "Dover Device" (November-December 1979) was read with interest by members of this organization.

In mid-1979, construction was completed on our subcaliber, scaled tank range. This is the first range of its type in California. We were also faced with a lack of suitable illumination for night firing; and concurrently with New Jersey, we developed a device very similar to the "Dover Device" described in the article.

The major difference in our device is in the type of light bulb used in the headlamp unit. The normal tank headlamp bulbs have been replaced with aircraft landing lights of similar size and voltage. We are currently using a General Electric aircraft bulb, Number 4596, which is a sealed beam unit of 250 watts. The principal advantages are: brighter light, a narrow beam (similar to that of the AN/VSS-1 searchlight), and it works especially well with the standard IR filter in place.

GEORGE W. SMITH
Captain, Armor, CALARNG
San Diego, CA

The Brewster device discussed in the Master Gunner's Corner of this issue will accept the standard tank headlight assembly without having to install another device just for a "searchlight." ED.

Backbone of the Army

Dear Sir:

Congratulations to Command Sergeant Major Gillis on "The Command Sergeant Major" (***ARMOR,*** March-April 1979). I just ran across his excellent article in reviewing back issues of ***ARMOR*** that I missed seeing while I was in the 25th Infantry Division. His philosophy and common sense list of "do's and don'ts" for the battalion commander should be priority reading for all prospective battalion *and* brigade commanders.

Restoration of NCO responsibility, authority, and prestige is, in my judgment, one of the most important challenges facing the Army in the 1980's. While high-level commanders and policymakers must commit themselves to this endeavor (as, indeed, have General Starry—"Sergeants' Business," and General Grange—"Commandant's Note," and others), the "point men" in the battle may well be the battalion commander and his CSM.

If the battalion commander-CSM relationship rests on the solid foundation of "frankness, integrity, and absolute trust" suggested by CSM Gillis, then they can do more to lend credence to the adage that "the Noncommissioned Officer is the backbone of the Army," than reams of official pronouncements to that effect. By their concerted actions, they can influence and educate officers, NCOs, and soldiers alike on the rightful role of the NCO in the workaday battalions of the Army.

Viewed in isolation, efforts of the battalion commander and the CSM, however productive, may seem minuscule, given the magnitude of the challenge. Viewed cumlatively, such efforts are precisely the kind of broad-based, ground-level action needed to bolster the "backbone of the Army" and improve the Army as well.

Again, kudos to CSM Gillis on a splendid essay (and to you on a superb magazine!).

THOMAS B. VAUGHN
Lieutenant Colonel, Infantry
Professor of Military Science
Washington and Lee University

Comparing U.S. and U.K. Units

Dear Sir:

Captain Douglas S. Aykroyd's article, *12th Lancers at Moy,* in the January-February 80 issue of ***ARMOR*** was well written and quite interesting, especially for those of us in Cavalry units who may face similar situations in the future.

I would like to quibble over the graphics that accompanied the otherwise fine article. On page 22 it would appear that the 12th Lancers had three *battalion-sized* squadrons (lettered A through C). This was not the case. Even though U.S. battalions and squadrons are similar of size, British cavalry squadrons are company-sized and their troops are platoon-sized! This problem remains current today when U.S. and U.K. units operate together: often the force supplied is either three times or one-third the force anticipated!

Perhaps an article on comparative size of like designated units in NATO would be helpful.

CHARLES F. SANTOSE
Major, Armor, OHANG
Stow, OH

Anyone interested in doing such an article? Ed.

Looking for Veterans of TD Battalions

Dear Sir:

I am writing a book on the Elsenborn, Belgium sector of the Battle of the Bulge. Three tank destroyer (TD) battalions played a critical role in stopping the panzers of the German 1st SS Panzer Corps and thereby preventing the Germans from reaching the Meuse River at

Liege, Belgium. These were the 612th, 801st, and 644th.

Unfortunately, I've not been able to locate any group or association that may have been formed after WWII for the veterans of these units. They apparently dissolved without a trace.

Armor played a major part in the battle, specifically one tank battalion, the 741st, and four TD battalions: the three cited plus the 893d. While there are associations for the 741st and 893d, there appears to be none for the other three, as I've indicated.

I don't believe an account of the Elsenborn battle would be complete without reference to the stories of tankers and TD'ers who fought in it.

JOSEPH C. DOHERTY
P.O. Box 14259
Benjamin Franklin Station
Washington, DC 20044

Total Support

Dear Sir:

As a tanker of the 70's, I anticipate the challenges of the new decade with renewed interest and vigor in light of Major General Lynch's comments in the January-February 1980 issue of *ARMOR*. Those of us who day-in and day-out train armor crewmen will fully appreciate and accept with welcome arms the long-overdue proposed restructing of the Advanced and Basic NCO Courses.

Training for and fighting the battle is theirs—Sergeant's Business. The thoughts of General Starry echo loud in our minds as we must gear more rapidly for the next onslaught. Until the time arrives that every NCO is prepared to train in peacetime and to lead in battle, our forces face nearly insurmountable odds in winning the next battle. It remains then the mission of the Armor Center to restructure and implement the [training] strategy for the 80's now. General Lynch, you have our total support.

AUGUST RUNTE
Captain, Armor
Readiness Group Dix
Fort Dix, NJ

Royal Lancers (Prince of Wales)

Dear Sir:

Thank you very much for sending us a copy of the recent issue of your excellent magazine. I read Captain Aykroyd's article with great interest. He certainly writes well and I was very interested in the conclusions that he drew.

You will be interested to know (and perhaps Captain Aykroyd will as well) that history has formed a full circle and our close support battery at the moment is 'J' Battery, Royal Horse Artillery. In November we are moving to another brigade where we will once again find ourselves alongside the 14th/20th Hussars, with whom we were brigaded at Moy in August 1914.

LTC The Honorable P. H. LEWIS
9th/12th Royal Lancers (Prince of Wales)
Swinton Barracks

A Suggestion

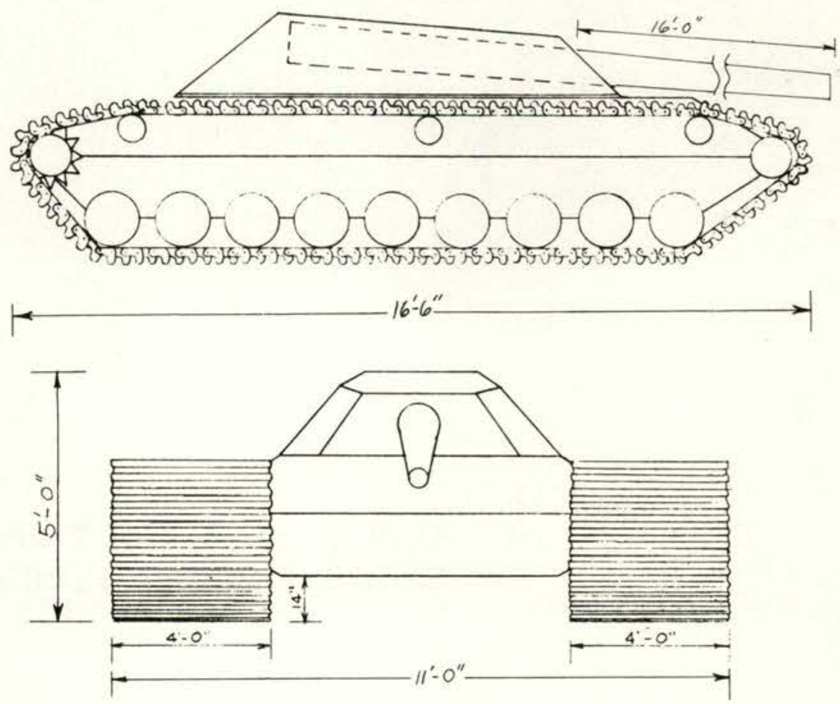
Dear Sir:

I was a platoon leader for 3½ years in World War II and have appreciable experience in tank combat as a platoon leader. As nearly as I can tell, most of the problems of equipment that we had in World War II still exist. Our tanks still have too high flotation pressure and guns with too low muzzle velocity, are too easily penetrated, and make too much dust and noise.

The rudimentary design of a proposed combat tank (figure 1) will cure most of these problems and is adapted to laminated plate and composition armor and will be much less expensive to produce.

I realize the futility of this suggestion, but the "mess" we are in now, armor wise, makes me want to try one more time.

ALVIN H. PARKER
Odessa, TX



THE COMMANDER'S HATCH

MG Thomas P. Lynch
Commanding General
U.S. Army Armor Center
and Fort Knox

Update on Armor Training Strategy for the 1980's

In the January-February issue of the "Commander's Hatch", I outlined the proposed new Training Strategy for the 1980's. In this issue, I am pleased to report that the Armor Center is already well on the way to making that strategy a reality. In taking the first step toward the top-down restructuring of our institutional courses, the Armor Noncommissioned Officer Advanced Course has been converted into two new courses; a Tank Platoon Sergeant Course and a Cavalry Platoon Sergeant Course. Effecting this conversion has not been a mere pencil drill. It has been out with the *Old* and in with the *New*. These courses are totally different in concept and content from the old Armor Noncommissioned Officer Advanced Course. The intent is to place tank and cavalry platoon sergeants in the field with the requisite skills to "take charge" and achieve and

maintain combat readiness. Therefore, I will use the remainder of this article to provide you some specific information on the new courses.

In order to understand how we selected the content for each of the new courses, you must understand the missions that the platoon sergeant must be able to perform. Our assessment, in each case, was that he must be:

- Capable of performing all of the tank or cavalry skill level 1-4 tasks.
- Capable of performing as a platoon leader when required.
- Capable of planning, organizing, and conducting tank gunnery training at Master Gunner level.

With these three broad missions in mind, we started a course content selection process which required us to analyze and select tasks for training which would serve those missions identified. Before we started that process, however, we made the assumption that the NCOs attending the courses would be qualified in the skill level 1-3 tasks of their MOSs. Therefore, there would be no requirement to select tasks for training from lower skill levels. That held true for the tank platoon sergeant, but that was not the case for the cavalry platoon sergeant. From scout through scout squad leader, the cavalryman's primary TO&E vehicle is an *M-113* Armored Personnel Carrier. When he is promoted to platoon sergeant, his primary vehicle becomes a main battle tank, a vehicle on which he has not been trained. Accordingly, it is necessary to train him as a platoon sergeant and as a tank commander. Because of this difference, we had to treat these courses differently. Let's look at them:

First, the Tank Platoon Sergeant Course. This course is 11 weeks in length and trains the NCO to perform the tasks necessary to achieve the missions identified in our assessment. This course has the following significant features:

- It is heavily weighted in training management procedures, advanced tank gunnery, and tank platoon tactics.
- It incorporates all of the tank gunnery and training management lessons from the Master Gunner Course.
- It includes selected tank gunnery tables for the purpose of reinforcing other training such as, how to establish ranges, how to conduct range firing and how to use tank gunnery training devices.
- It includes an 84-hour, day and night, tactical field training exercise.
- It includes classes on effective reading, listening, and writing.
- It requires that remedial training on lower skill level tasks be accomplished after normal duty hours.
- It provides for conducting part of the training concurrently with the Armor Officer Basic Course.

During January through March of this year, we conducted a pilot of the new Tank Platoon Sergeant Course, and from all indications, it exceeded our expectations. A detailed analysis of the pilot is currently underway, and we anticipate that only minor revisions to the course will be required. If that is the case, we plan to implement fully the new course in July 1980.

The Cavalry Platoon Sergeant Course is 12 weeks in length, and like the tank course, contains the training required to prepare the NCO to perform each of the tasks necessary to achieve the missions identified in our mission assessment. The major differences between the cavalry course and the tank course are:

- It includes the necessary training on tank related skill level 1-3 tasks to prepare the NCO to perform as a tank commander.
- It requires the students to negotiate all of the tank gunnery tables, except Table VIII.
- It includes cavalry tactical training.

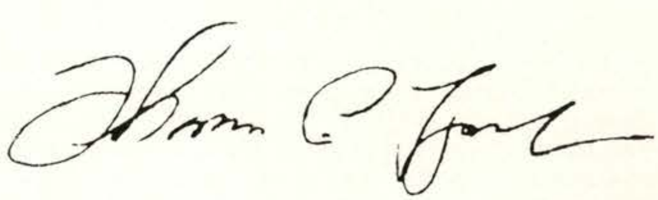
A pilot of this course will be conducted during May through July of this year. If the pilot of the Cavalry Course is as successful as the pilot of the tank course, we will go to full implementation during the first quarter of FY 81.

The full implementation of these courses will serve as the catalyst for "shoring up" our NCO ranks with highly-trained, technically-competent platoon sergeants. This in turn will serve as the springboard for total realization of the 1980's Training Strategy.

Toward this end, we have completed the initial analysis of the content of the Armor Basic NCO Course (BNCOC) against the needs of the field. The result is a determination of what must be done to convert the current course to a Tank Commander's Course. The key challenge in meeting the needs of the tank commanders and the field is standardization. Thus, all NCO academies which offer the revised BNCOC will have uniform requirements and training standards. To date, the course design efforts shows that some of the training on non-tank related tasks must be deleted in order to have sufficient course time to add more training on tank related tasks. Our goal is an exportable package by the end of the summer. We are also in the process of developing a program to change the Basic Armor Training Courses (19E and 19F OSUT) into a System Specific Armor Crewman Course. The thrust is to produce crewmen who would have completed all of the training currently divided between the gunner/loader and driver courses.

In future issues of the "Commander's Hatch", I will apprise you of our progress towards total implementation of the Armor Training Strategy for the 80's. Until then, we will continue our efforts to improve the quality of the Armor training that is currently conducted at Fort Knox. In the interim, a close and real-time relationship between the field and the Armor Center is essential to insure that the needs of the Armor Force are met.

Forge the Thunderbolt.



Master Gunner's Corner

Subcaliber Devices

Currently, there seems to be an infinite number and variety of subcaliber devices in the field which are designed to support tank gunnery training. Compounding this problem is a lack of understanding of the intent and training value that the subcaliber devices were designed to provide.

This article is not an attempt to knock subcaliber devices and methods currently in use Army-wide. Rather, the initiative and innovative approaches that have been taken to meet the guidelines outlined in FM 17-12, *Tank Gunnery,* for subcaliber firing are to be commended.

Subcaliber firing is intended to provide the armor unit a training vehicle to transition tank crewmen up to basic gunnery skills. That is the point where a tank crew can effectively interface with the fire control system and interact with one another. In the past, this capability was achieved after much repetitious firing of costly main gun ammunition on the old Tables IV and V.

With the rising cost of ammunition and greater restrictions on the military budget, a new approach in our methods of training became essential. The devices discussed in this article will never match or duplicate the main gun for performance or hitting capability, but will provide essential training to teach the necessary fundamentals before the tank crew expends costly main gun ammunition.

The Armor Center has recommended two devices to accomplish this training—the *Brewster* and *Telfare.* (The Commander's Hatch, ***ARMOR,*** Sep-Oct '79.) However, the availability of these devices was limited; consequently, armor units used what devices they had on hand or could fabricate. The results were a multitude of different devices, all intending to do the same job; such as the *Nacca* device, the *Dynamit Nobet* 14.5-mm inbore, the *Riley* 20-mm inbore, and the .22-cal inbore. The list can go on and on. This variety of devices created the problems of lack of familiarity with the devices due to tankers transferring from one duty station to another and lack of confidence in the devices because some were difficult to operate and maintain, or were unreliable.

The Armor Center selected the *Brewster* and *Telfare* devices for tank gunnery training based on tests conducted by TACATA and the Armor Center, and at last, it can be reported that the field will receive them shortly.

The *Brewster* device (figure 1) will mount either an *M-16* rifle or the *M-55* laser device.

The rifle offers the most accurate and versatile configuration. It is accurate to 460 meters when firing 5.56-mm ammunition. By changing the bolt assembles, .22-cal ammunition can be fired with good accuracy to about 100 meters. The *Brewster* is recommended for support of firing on Tables IV and V-P, and can also be used on Table V. With the appropriate bracket, the *Brewster* can be mounted on any tank or *M-551* in the inventory. This device is designed for use with scale targets and offers the advantage of frequent home station firing. Its principal disadvantage is that when it is used on all tanks other than the *M-60A3* and *XM-1,* the computer must be turned off and the tank commander (TC) does not practice ranging on targets. However, the minimum ranging distance of 200 meters for the laser rangefinder of the *M-60A3* and *XM-1* permit the employment of the full-up fire control system. The recommended tables, ammunition, and scales to be fired with the *Brewster* follow:

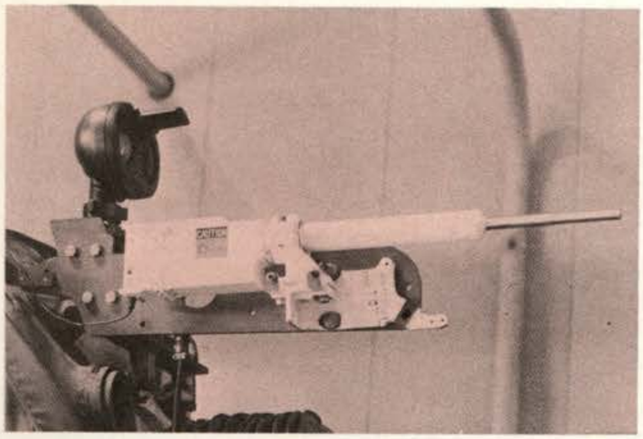


Figure 1

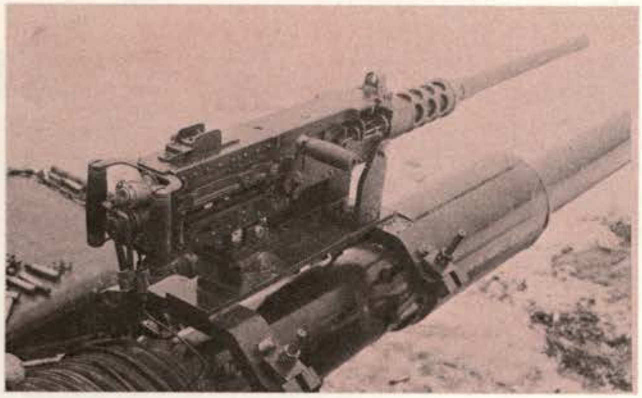


Figure 2

Figure 3

Figure 4

Tank Table IV & V-P	Ammunition	Scale
M-48A5, M-60A1/A2, M-551	.22-cal or 5.56-mm	1/60 or 1/35
M-60A3 and *XM-1*	5.56-mm	1/10 and 1/5

The *Brewster* device is currently being tested for type classification by the project manager at the Training Aids and Development Center. Type classification is expected by late spring or early summer, and issue to the field should be made by late fall or early winter of this year. This device will be available to all Active Army, Reserve, and National Guard units, and the number to be issued will be determined by ranges or armories available to each unit or installation.

The *Telfare* device or *M-179* (figure 2) was redesigned by the Army Armament Research and Development Command, (AARADCOM) last year and type classified as the *M-179.*

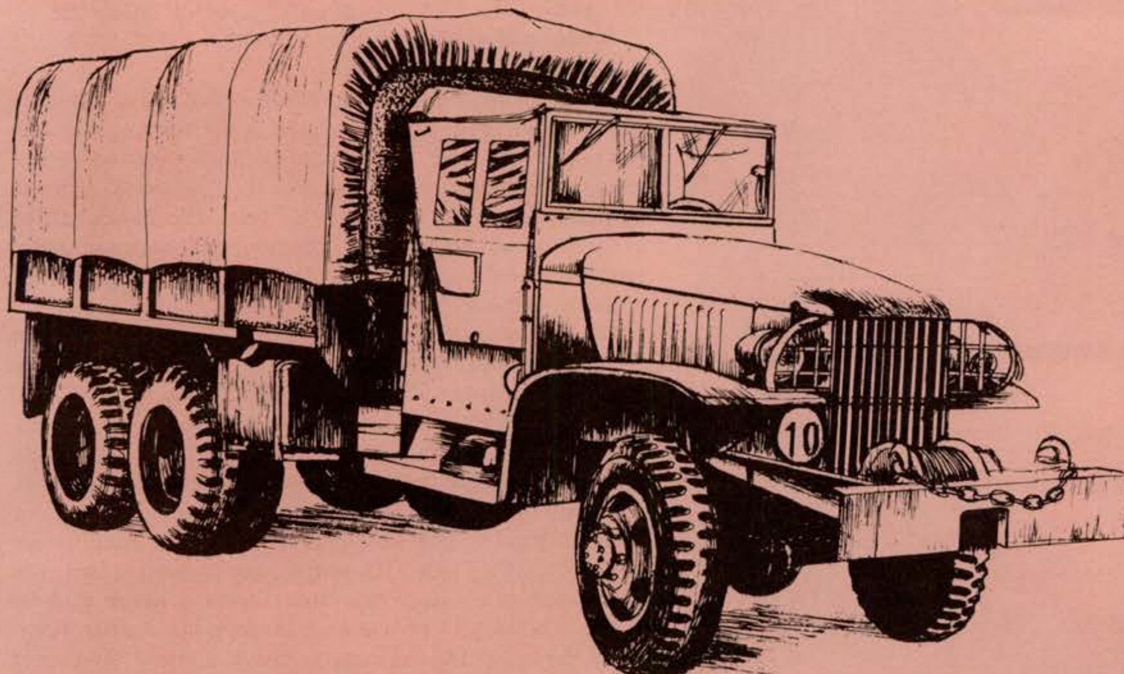
The *M-179* can be mounted on all tanks in the Army inventory, normally to the rear of the main gun or gun/launcher, but it is mounted on the bore evacuator of tanks equipped with a thermal shroud (figure 3). This device is recommended for firing all main gun tables except the tank crew qualification course (TCQC), Table VIII, which is not fired subcaliber. The *M-179* will offer acceptable accuracy to a range of 1400 meters. The *M-179's* principal advantage is that it offers training in the use of the fire control system, allowing the gunner and TC to interact much in the same manner they would with main gun and at a fraction of the cost. A major disadvantage is that for the retention of accuracy, only one ballistic cam can be used. It should be noted that the *XM-1* tank has a .50-cal ballistic computer solution just for this device, which should offer even greater accuracy. The recommended tables, ammunition, and scales to be fired with the *M-179* follow:

Tank Tables VI, VII & IX	Ammunition	Scale
All tanks	.50-cal M-20 API-T	Full

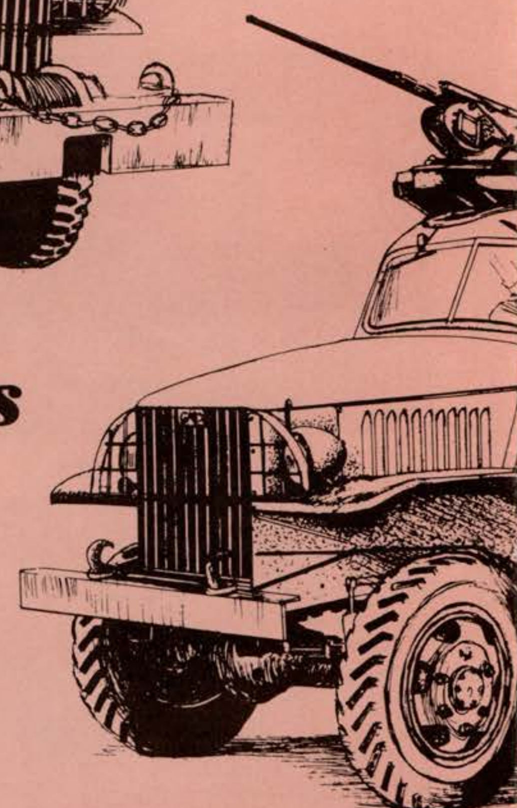
The *M-179* should be available to all Active Army, Reserve, and National Guard units this summer on the same basis-of-issue as the *Brewster* device. As a footnote, AARADCOM is developing a universal *M-179* that will mount on the searchlight mount of the *M-48A5, M-60, M-60A1,* and *M-60A3* tanks, (figure 4) and just over the main gun mantlet of the *XM-1* tank. This configuration offers greater ease in mounting and superior accuracy in stabilized firing, particularly when compared to the *M-179* mounted on the bore evacuator. Additionally, the searchlight version can remain mounted while the main gun is fired; whereas, the strap mount version cannot. Further tests may be necessary, but the universal *M-179* (searchlight mount) should be in the field by next year.

The *Brewster* and *M-179* devices are tailored to meet the needs of our armor tank gunnery training today. Getting a first round hit with the *M-179* is not the most important thing. What is happening inside the turret is what really counts. We must be more concerned about accurate ranging and ensuring that the gunner is taking up the correct sight picture. If that is done, the P_h will show up when the crew fires the main gun because they have mastered the basic skills.

LAWRENCE G. MILLER
Sergeant First Class
Senior Instructor
Master Gunner Branch



Red Ball Express



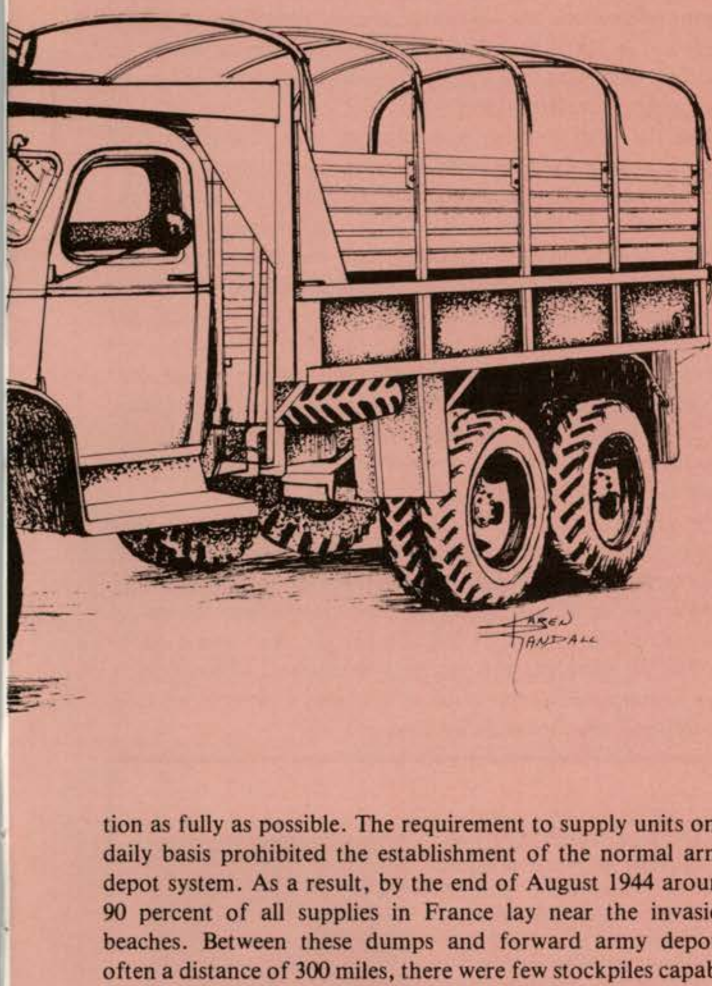
by Captain Michael W. Cannon

Small unit leaders from squad to company level tend to overlook the importance of logistics and the difficulties inherent in supplying combat units with all classes of supply. Quite often they forget the importance of supply discipline and the need to husband resources available at battalion and company level. The very real possibility of a severe degradation in the quality of support which could be available in future conflicts is not often considered when designing and conducting training exercises.

If the next war is indeed violently intense and short in duration, the role which logistics plays may be minimal. On the other hand, if the war becomes protracted and sizeable in scope, logistics will play a vital role, especially in a fluid and mobile situation. Resupply of forward units at all levels may become spotty and possibly nonexistent.

The breakout of Allied forces from Normandy and pursuit of the German Wehrmacht was just such a mobile operation and provides us with a precedent which we can analyze. From a brief study of one of the key expedients developed to provide resupply to the advancing American armies, we can rediscover some of the harsh realities involved with keeping supplies moving.

The situation in Normandy after the breakout operations of 1 to 4 August 1944 necessitated a marked departure from the carefully conceived Overlord plan. The sudden collapse of the German military machine opened the door to a fluid situation where the initiative of subordinate commanders was of paramount importance. Tactical operations were characterized by a minimum of control and are described in the Official History of the U.S. Army as resembling a "stampede of wild horses." The orderly development of a logistical base was thus subordinated to the need to exploit the tactical and strategic situa-



tion as fully as possible. The requirement to supply units on a daily basis prohibited the establishment of the normal army depot system. As a result, by the end of August 1944 around 90 percent of all supplies in France lay near the invasion beaches. Between these dumps and forward army depots, often a distance of 300 miles, there were few stockpiles capable of supporting large units conducting sustained operations.

The Communications Zone (COMZ), an extension of the Services of Supply in the United Kingdom, was the organization which had been tasked with the development of the logistics base which was required to support Allied forces. As operations outpaced the supply buildup, planners began to look for solutions, however improvised they might have been. At first, the COMZ decided to place 100,000 tons of supplies (exclusive of POL) in the Chartres-La Loupe-Dreux area by the first of September. Initial plans relied heavily on the utilization of the existing French railway system to transport the majority of the tonnage. But as the Allies advanced, they found to their chagrin that air attacks and sabotage undertaken by the *Maquis,* operating under the control of the London headquarters of the French Forces of the Interior (FFI), restricted the amount of traffic that the network could be subjected to. Only a relatively small part (approximately 18,000 tons) of the desired stockage could be shipped by rail. The remaining 82,000 tons had to be transported by truck. The resulting centralization and usage of motor transport on a scale larger than invasion planners predicted came to be immortalized as "The Red Ball Express."

The operations along the Red Ball began on 25 August 1944. On this day, vehicles in 76 truck companies out of the 118 companies allocated to the resupply effort were in action. All but five companies were to ultimately be used for the hauling of supplies between the beaches and the Chartres area. Within five days of its inception, the Red Ball reached its peak operational level. On 29 August, 132 companies (approximately 5,950 vehicles) delivered 12,342 tons of supplies, a total which would not be achieved again. The first phase of the operation came to a close between 1 and 5 September. The Red Ball was then given a new lease and was expanded to include a route to Soissons (First Army Area) and Sommesous (Third Army Area), ultimately covering 686 miles along the Siossons route and 590 miles along the Sommesous route. On 15 November, the Express officially ceased operation. During the next year, other immediate supply operations had to be improvised, yet none approached the sheer magnitude of the Red Ball.

A hypothetically normal run on the Red Ball was supposed to have been conducted along the following lines. Vehicles were to pick up supplies at the port of Cherbourg and then to proceed to St. Lo. Here they were organized into convoys and dispatched from a traffic control point which was tasked with regulating the convoy movement. Ninety to 150 miles later the convoys would approach the dump areas astride the route. Either here or at the bivouac sites fresh drivers would take over for the run back to St. Lo. There the process would begin again.

As with most improvised operations, actual practice was quite different from what was planned. Convoys were often dispatched even farther east than the Chartres triangle as the armies advanced. Dumps would close down and relocate farther forward while convoys were enroute, causing drivers to have to search for a unit which would accept their loads. Both individual vehicles and entire convoys were often diverted by representatives from various divisional or army units. Coordination problems such as these plagued the Red Ball throughout its existence.

Resupply on such a scale required the marshalling of tremendous amounts of resources from every corner of Bradley's Army Group. Many combat units arriving in the theater were stripped of their transport as were units classified as nonessential (such as antiaircraft and heavy artillery).

To control effectively this gathering, several new control measures had to be adopted and enforced along the Red Ball route. All roads traversed by the line were marked with a large red ball to obviate the necessity for maps and delays caused by map reading mistakes. Traffic on these marked throughways was to be reserved expressly for vehicles supporting the logistic effort and was only to move in one direction. Trucks were organized into convoys which were then divided into serials.

All movement was to be conducted in these groupings at a speed not to exceed 25 miles per hour. Intervals between each vehicle were to be 60 yards and there was to be no passing. Stragglers were to get assistance from support units (maintenance units and engineers) located along the route and then rejoin other convoys carrying cargos of the same type. Halts for breaks were permitted only for 10 minutes beginning 10 minutes before every even hour. Due to the urgency of the resupply mission, the shuttle was to operate through a 24-hour period. The lack of opposition from the *Luftwaffe* and dominance of the skies by Allied air allowed convoys to proceed using full headlights. Delays caused by operating under blackout conditions were thus avoided.

These measures are only a partial listing of those which were finally incorporated into a succession of SOPs. The intent behind them was to force a structure onto a disorganized system. Not all measures were enforced with the same amount of consistency, enthusiasm, or success.

General Sir Brian Horrocks offers us a more realistic description of Red Ball operations in his book *Corps Commander:*

> "Convoy after convoy of their far more powerful six-wheel lorries, endowed with far greater acceleration and much better hill-climbing capability than was possible with our smaller four-wheel Fords and Bedfords, swept past me, usually being driven by cheerful-looking Negroes with a cigar in their mouths. They seemed to be made of rubber; as often as not, one leg dangled out of the driving cab, while the other presumably operated the accelerator pedal. No such nonsense as vehicle spacing for them; they just raced flat out for their destination and, in spite of not having the vaguest idea as to where they were going, they usually, thanks to the indefatigable military police on their powerful motor bikes, got themselves to their correct destination in the end. . . ."

The Red Ball performed wonders in terms of resupplying the forward units during the pursuit. However, the debilitating effects it had on the logistic base were felt for months to come. The Red Ball ultimately extended over five rear areas which were all tasked with full responsibility for maintenance and control of specific sections of the route. The committment of resources to this responsibility varied according to the temperament of the section commander involved. As a result, friction between the Advance Section (responsible for the transport units involved) and the various COMZs which were traversed increased considerably.

More pronounced in effect was the strain placed on the vehicles used. Continual usage with little preventive maintenance being performed brought about a rapid deterioration of equipment and roads. Additionally, the units along the Red Ball were authorized by the Department of the Army to overload vehicles by one-half their listed capacity. As a result, the number of repairs involving major components skyrocketed, placing an additional burden on the logistic tail. An average of 100 trucks per day were withdrawn from the Red Ball and by November 15,000 had been deadlined. Just as critical as the drain on spare parts was the failure of tire repair shops to keep up with the demands of using units.

The effect the operation had on the personnel involved was not as easily quantified but was just as harmful. Continual strain and minimal supervision led to a slackening discipline and came to be accepted as the norm rather than the exception. As time progressed, soldiers of less than desirable character found that the opportunities for malingering, sabotage, and black marketing abounded. The haste involved in shipping contributed to poor documentation of shipments and sparse information on supply status. As a result, supply accountability was lost and units received items they no longer needed or less than necessary. The complications caused by the Red Ball permeated all levels of the logistic effort and many were never successfully resolved.

The Red Ball Express was a hastily improvised expedient originally conceived as only a temporary measure. It accomplished its mission, although in the process it exacted a terrible price from the logistic structure in terms of personnel hardships, disciplinary problems, and equipment deterioration. What would have been the chances of its success if the *Luftwaffe* had had air parity with the Allies? What if the supply routes had to pass through hostile territory and be subjected to the type of harrassment that the *Maquis* had inflicted on the Germans? If either of these conditions had been a reality, the Red Ball effort would have been drastically reduced in effectiveness and the story of the Allied pursuit may have had quite a different ending.

Supply in peacetime is at times somewhat tenuous. In wartime excesses become even more exaggerated. In an extremely mobile situation as experienced in 1944 or in the face of a determined air threat, resupply may become nonexistent or only partially effective. Those who suffer from it most will be those at the battalion and company level who form the cutting edge. If supply discipline is not emphasized and enforced now, the result in wartime may be disasterous.

CAPTAIN MICHAEL W. CANNON was commissioned in Armor upon graduation from the U.S. Military Academy in 1975. A graduate of the Armor Officer Basic, Organizational Motor Officer, and Infantry Officer Advanced Courses, he has served as a platoon leader and XO of the HHT, 1/11th ACR and as chief of housing for Fulda Military Community. He is currently serving as the S4, 2/3d ACR.

Recognition Quiz

This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

(Answers appear on page 60)

1

2

3

4

5

6

The Active Defense

by Captain Wayne M. Hall

Although plagued with fallacies, the active defense concept has the capability to work in theory, and, with proper leadership and training, in practice. Success, however, will require the U.S. Forces to be better than the Soviets and to capitalize on the traditional Soviet weaknesses in flexibility, training, and leadership.

To ensure that our divisions are prepared to conduct and win a wide-front defense, rethinking of some tactical operational procedures will have to occur. These include decision making, communications, logistics, intelligence, and maneuver.

In my opinion, some of the critical concepts outlined in FM 100-5, Operations, are nebulous, vague, ignored, or left up to the discretion of the commander on the ground. The following, then, is a presentation of a concept of operations in the active defense at the lower-level and a discussion of some of the problems that may be expected to occur.

Commanders at all levels will have to face the reality that many units of varying sizes will be cut off from their parent units if the Soviets attack. This problem will have to be rectified through several different methods.

Commanders will have to supply cutoff units through low-level air drops or create a corridor to rescue the unit. The Germans in World War II (WWII) used the latter method while the linkup was being conducted, and the cutoff unit usually took a fearful toll on the forces surrounding them.

Units will have to stay in place and inflict the maximum casualties on the Soviets. None of us want to accept this philosophy, but we must come to grips with it. If the Soviets conduct a massive attack, successful blocking of penetrations will have to take precedence over rescuing cutoff forces. These forces will have to become islands of defense (such as the Soviets used to great effect in Stalingrad during WW II), inflict maximum casualties on the attacking forces, and then ex-

filtrate to friendly positions while damaging the Soviet lines of communication to the maximum extent possible.

Casualties in all areas of the division sector will be higher than in any previous conflict in which U.S. Forces have been engaged. This is based upon the concept that "there is no tomorrow" and that we must win or lose rather than trading space for time and living to fight another day.

The active defense will be conducted while the enemy has air superiority or, on a best-case basis, air parity. This will cause a chain reaction of events in logistics, troop movement, use of combat aviation, and ultimately, in maneuver. Initially, Air Force input as a combat power multiplier will have to be reduced as these forces will be trying to achieve air superiority or parity. Additionally, our ability to reconoiter the enemy through aerial systems will be significantly hindered.

The Soviets will use *blitzkreig* tactics, so well practiced by the *Wehrmacht* of WW II, complete with lightning surprise attacks, penetrations by mechanized infantry, and breeching and exploitation by heavy armor forces. Lines of communication will be clogged by streams of refuges moving to rear areas. These civilians will be continuously strafed by Soviet high performance aircraft to sew the seeds of fear and panic. Refugees will seriously impede the lateral shift of combat power and logistical support moving forward to provide at a minimum, Class I and III supplies to frontline units. Soviet commandos and other rear area forces will mine roads, ambush supply columns, and eventually force allied commanders to divert combat strength to protect rear areas.

We must recognize that the Soviets view the covering force as exactly that, and will probably plow through it with minimal expenditure of men and material. They know our doctrine, training, and technical systems. Therefore, they will save the preponderance of their combat power for achieving the breakthrough in the main battle area (MBA).

Several areas within the MBA will be denuded of any combat power. Once again, terrain and environmental conditions will dictate which ground this applies. Primarily, our forces will need to concentrate on the high-speed avenues of approach where the Russians have the potential to achieve a rapid breakthrough. We must not forget, however, the lesson of the Ardennes Forest in May 1940. Any unguarded area must be surveilled to assist in reducing the risk of surprise.

Combat intelligence will be of paramount importance, since through these systems the division and corps commanders will "see" the battlefield and formulate the decisions which will decide success or failure in conducting the active defense. Every system must be used to ascertain where the main and secondary attacks will come. We must not rely totally on sophisticated technical systems for information as they are susceptible to jamming, deception, and atmospheric and evnironmental limitations. Technical systems must be complemented by human judgement to achieve the most efficient and reliable intelligence for the division commander. *If combat intelligence fails, the active defense will almost certainly fail.*

In the confusion of major combat in the wide-front defense, resupply will be difficult at best. POL points and ASPs will have to be intelligently located while preparing the battlefield, and at least the initial resupply of vital elements to combat units will have to be conducted during periods of limited visibility, until allied forces establish air superiority. Our soldiers will have to do without accustomed luxuries as the resupply effort will have to focus on POL, ammunition, and subsistence.

Once the battle starts, communication and distance factors will necessitate a change in organizational decision making and responsibility. Due to 100-km frontage, expected poor communications, and the realization that the division commander cannot move with the heliborne freedom of Vietnam, most decisions will have to be made by the brigade commander on the ground. The division commander will have to establish the critical area in the MBA and move with the TAC CP for communications to that area and run the war.

The Soviets will seek to capitalize on U.S. Army weaknesses, including boundary confusion; susceptibility to night operations; operational security (OPSEC), (especially of rear area installations); poor communications security (COMSEC); the excessive reliance on communications equipment for command and control; and the psychological problems inherent to mass attacks and the disdain in which heavy loss of life is held by enemy forces.

The Covering Force

The philosophy of "loading" the covering force area with one-third of the division's combat power is questionable. This quarrel is based on several premises which are hypothetical only.

We assume away our opponents intelligence. The Russians know our doctrine and our covering force *modus operandi.* Therefore, they will use only the minimal force necessary in attempting to destroy rapidly the covering force, continue massive deception of his main attack(s), and attack the MBA in nearly full strength.

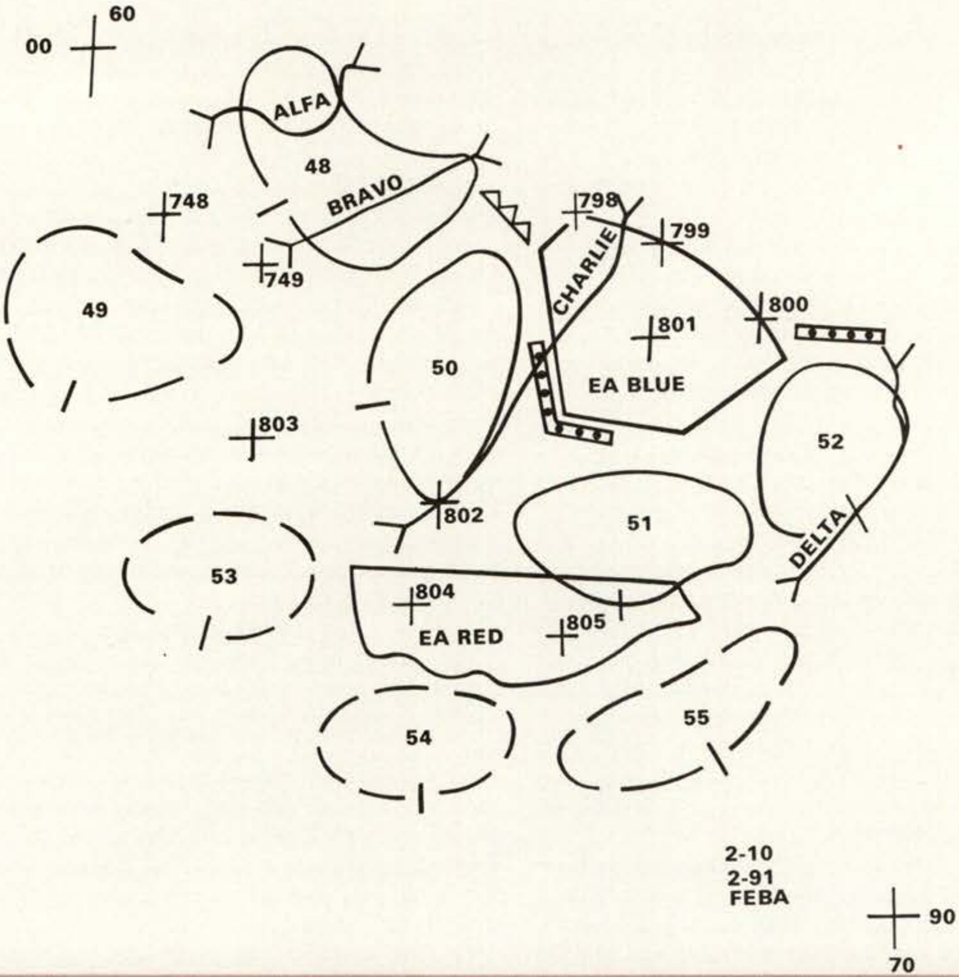
We plan to emplace heavy artillery forces in the covering force area (CFA) and some argue that all assets "in reserve," such as electronic warfare (EW) and engineer units, should be in the CFA. While recognizing the need for artillery and EW support to the covering force, the idea of committing the entire division artillery (DIVARTY) and corps artillery group and EW assets to a CFA is risky.

An excellent chance exists that the Soviets could knife through a covering force quickly, thus leaving significant artillery and engineer combat power cut off in enemy rear areas. A certain amount of artillery, EW, and engineer support, as deemed appropriate by the division commander, should support the CFA, but to risk "all the eggs in one basket" is extreme.

Communications

Divisional units preparing positions along the MBA, and, in fact, all divisional units should be under strict radio silence during the covering force operations. This discipline will assist in denying the enemy location of our main defense and basic intelligence information. The basic susceptibility lies in the relative ease in which airborne radio direction-finding (RDF) platforms can pinpoint exact unit locations, and, therefore, MBA and CP locations.

The division commander and his major subordinate commanders must communicate, however, and can do so if proper equipment and procedures are used wisely. First, multichannel may be used on a limited basis as its signal is difficult to RDF and intercept. Secondly, we should invest funds for directional antennas, which not only reduce vulnerability to direction finding and intercept, but also boost range, if sited correctly.



The division TAC CP should be well forward, in fact, in the vicinity of the covering force CP, for ease of communication and control. The primary means of sending information to division main should be through multichannel or secure FM radios, using directional antennas. These systems, plus traditional wire and messengers, will enable the division commander and his staff to direct successfully covering force operations in addition to providing concrete guidance to organic maneuver elements in the MBA.

The division communications system for conducting a four- to five-brigade active defense was originally structured to support a typical three-brigade force and a much smaller front. Albeit that communications during an active defense are of key importance, the fact remains that there is neither enough equipment of sufficient quality to support the concept. Therefore, besides waiting until Army technical systems catch up with tactical plans, we will simply have to improve the current system.

The following paragraphs enumerate ideas to help provide temporary solutions to the problem.

Intelligent siting is a must. Planners must recognize that FM is line-of-sight. A balance between high, line-of-sight signal sites and low, camouflage shrouded sites must be reached.

The *RC-292* antenna is the "dirtiest" antenna in the inventory. Being omnidirectional, it is highly susceptible to both airborne and ground-based direction finding (DF), thus neutralization. The solution to this problem is to invest in directional antennas or to use make-shift directional antennas which thwart the DF effort and, in most circumstances, increase range.

We should work on flexibility. Currently, for tactical maneuver, we are tied to FM radios. Commanders and staffs should be trained in exercises to use other methods such as RATT, multichannel equipment, messenger, etc. While slower, these means are less susceptible to FM restrictions.

Some aviation assets should be used for both aerial relay and messenger service. Probably, though, retransmission will be in short duration and conducted most extensively during limited visibility.

Our divisions should possess a motor messenger system which uses the motorcycle as its primary vehicle. The system must be fast, have reliable drivers, and possess a viable PLL system to be effective. This sytem will be especially important once we become fully cognizant of the Soviet electronic warfare capability.

Commanders cannot leave the onus of communication entirely on the signal officer. Commanders at all levels must:

- Know the capabilities, strengths, and weaknesses of communication equipment.
- Locate CPs intelligently to facilitate communication, camouflage, and rapid movement.
- Ensure that FM, RATT, and secure equipment is maintained and given technical inspections as frequently as possible.
- Force the command to be communication conscious. *This area will be as proficient as the commander influences it to be.*

Preparations

Several tasks can be accomplished which will improve conduct of the active defense:

The battlefield should be prepared before the enemy reaches the MBA. Specifically, the covering forces area and the entire division sector should be templated by terrain specialists and intelligence analysts. Templating is tedious and time consuming, but has tremendous potential.

The division should organize and train small (squad-sized) stay-behind forces to disrupt Soviet logistical support moving forward or lagering during an attack. These forces, obviously, would have to be highly trained and led by personnel thoroughly schooled in Soviet vehicle recognition, supply actions, demolitions, weapons, and, of course, survival. If operated correctly, these stay-behind forces could assist in exploiting a Soviet weakness—logistics—or at worst case, cause combat forces to be diverted from the main attack to protect their logistical effort.

It is strongly advocated that our tank crews be taught how to destroy Soviet tanks and APCs without their main gun because, in an active defense, we are so terribly outnumbered that every soldier must do his share of destroying. Our tank crews should be cross-trained to use LAWs, activate mines and demolitions, and should be taught how to operate Soviet weapons, grenades, *RPG-7s,* demolitions, etc.

We must assume now that the Soviets will enjoy certain successes and will make some penetrations in the division rear. Consequently, it is important that clerks, communications specialists, cooks, and headquarters personnel be highly trained to use their individual weapon, grenades, *M-60* machineguns, and LAWs to help impede a Soviet breakthrough. Equally important as the training itself is eradicating from these soldiers minds the philosophy that they will never have to fight.

Leaders at all echelons in the division should know intimately those Soviet weaknesses that were learned through the German experience of WW II, and as theorized by students of military warfare and academicians. The Soviet Army must not be projected to be infallable because it is recognized that they have individual and organizational weaknesses similar to those of most armies of the world. It is obvious that with the constraints in manpower and materials under which U.S. forces operate, that we must be brighter, more ingenious, and know our enemy's strengths and weaknesses better than he knows us. Some of the most obvious Soviet weaknesses that leaders at all levels could exploit include:

- Soviet Armed Forces' inflexibility. Once given a mission, they frequently attempt to accomplish the mission as originally stated, regardless of the cost.
- The Soviet Army is persistently poor in initiative throughout all levels. During WW II, this weakness resulted in slavish dependence on orders from above and preference for the fixed and approved formula.
- The questionable quality low-level leadership in the Soviet Army. Additionally, the question of how well the Soviet soldier will fight if not protecting the "motherland" remains an enigma. It can be speculated, however, that a well-executed active defense, with the corresponding high casualties to an attacking force, could cause morale problems. Additionally, this weakness could be emphasized by morale variables such as psychological operations (PSYOPS), plentiful minefields and boobytraps, heavy artillery interdiction (especially at night when Soviet troops are trying to sleep), napalm and cluster bomb units, and of course, night combat raids. In this sense, the soldiers in the active defense are actually on the offense against Soviet morale.

Combat intelligence systems should be perfected and practiced until leaders at all levels are comfortable with their critical role. Of crucial importance is the downward dissemination of information prior to commitment.

Europe is composed of many built-up areas. Key built-up areas astride or adjacent to vital attack avenues should be prepared for strongpoint defense, especially if it is determined that a major Soviet attack could not logically bypass the area. Each town should be defended, building-by-building and street-by-street, as was done in Stalingrad in WW II. Additionally, all the maneuver division's wartime terrain should be analyzed in detail for built-up areas, and detailed plans made to defend these areas.

Plans should be developed to use the civilian work force extensively to assist in the conduct of the active defense. First, these people have a vested interest in our success; and second, community cooperation, especially under adversity, is a national characteristic with the Germans. And, of great importance in the concept of mobility, civilians could assist in removing the refugee impediment from main arterials by assisting in refugee control. Rear area security and knowledge of the terrain are two additional significant capabilities of the civilian populace.

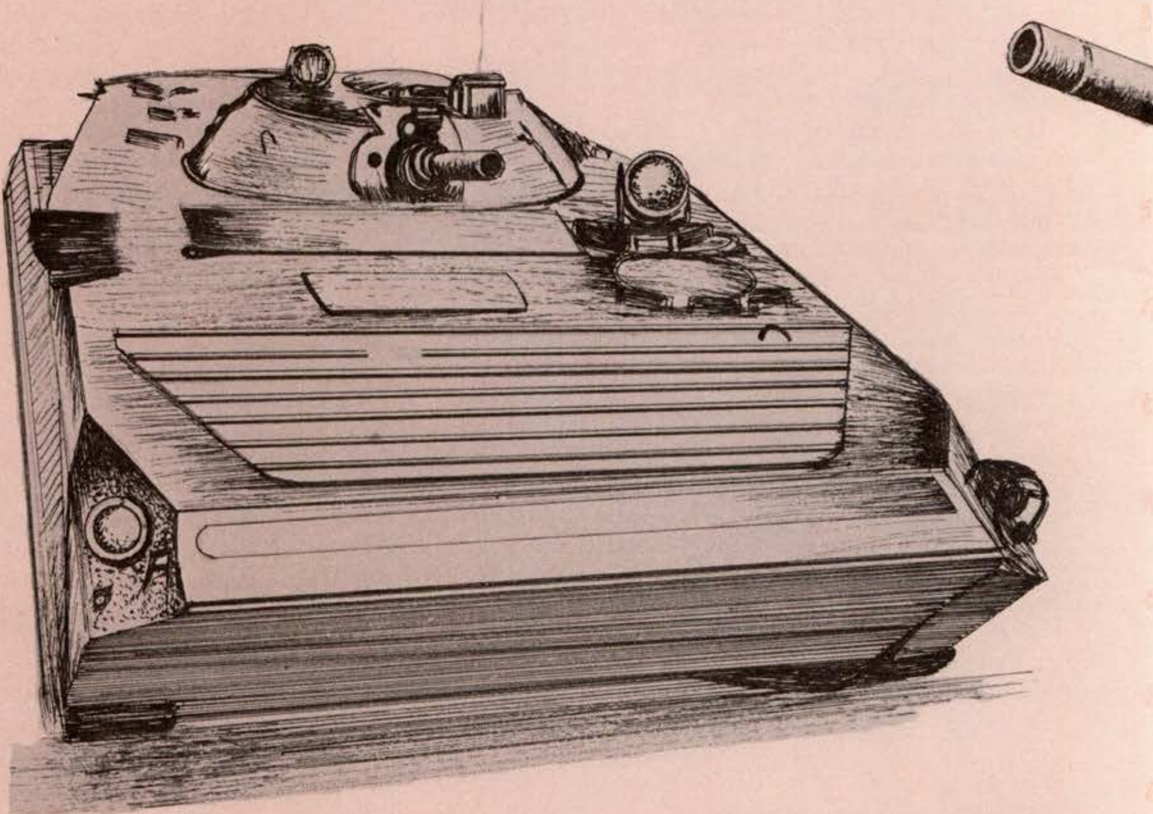
Conclusions

The ultimate success toward preparing for a successful active defense is to train for it. To provide adequate training, a microscopic examination must be made of all the various parts that fit into the whole concept. The active defense chain should not have a weak link or a "wait until the time occurs" attitude toward deriving successful implementation plans. A residual effect of creative thought and planning and training is the abstract, but powerful, concept of the desire to win. Traditionally, the offense is viewed as the only way to resolve a conflict, which is historically accurate. The offense is also imbued with a positive, rather than negative, spirit. Therefore, the idea that the active defense is first a temporary measure prior to an offense, and second, that the U.S. Army can conduct a viable active defense, complete with "offensive" defensive meausres, should be sold to all leaders and soldiers in our army.

CAPTAIN WAYNE M. HALL holds a commission in Military Intelligence. He has a bachelor's degree from the University of Nebraska, and a Master's degree from Kansas State University. He has served as S2 of the 3d Brigade 2d Infantry Division; S2, 1-18 Infantry, S2, 2d Brigade, and G2, all with the 1st Infantry Division. Currently he is attending the Postgraduate Course at the Defense Intelligence School, and is scheduled to report to the Army Concept Analysis Agency later this year.

An Evaluation

Soviet Combined Arms Operations



by Professor John Erickson
Director of Defence Studies
University of Edinburgh

How do "combined arms" combine? If that question were put to a Soviet officer, the answer would depend on which arm he served, hence the current Soviet debate, which is of the greatest import. The obvious place to begin is with *the tank,* the key weapon in the Soviet arsenal for all the prophesies and predictions of the demise or the eclipse of the armored fighting vehicle. However, the advent of the *T-64/T-72* main battle tank is proof of the Soviet command's undiminished faith in the tank as the most versatile and survivable battlefield unit and, above all, the best counter to enemy tanks.

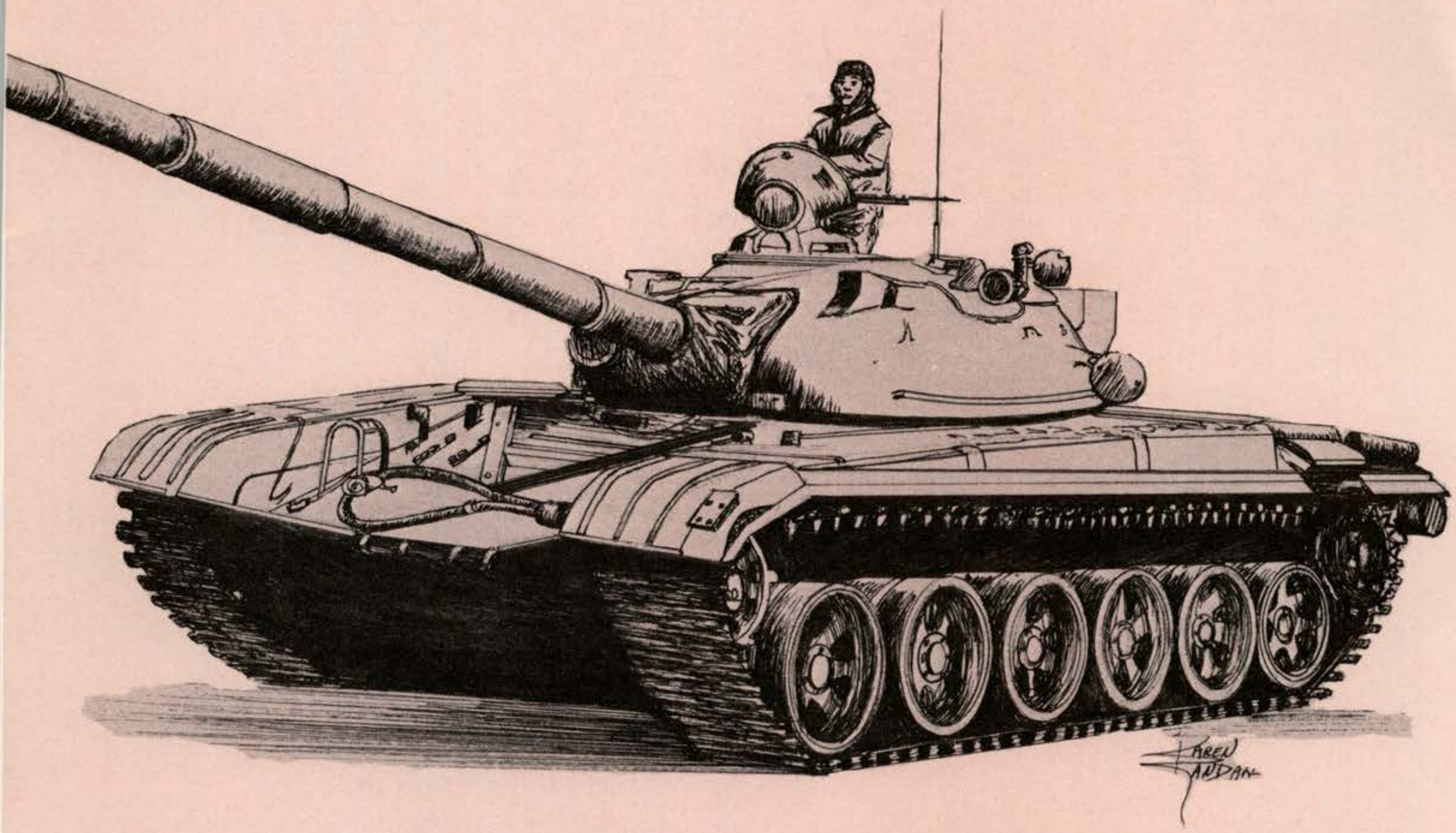
In the event of either contingency—general nuclear war or operations directed against Europe (or any other area of the Eurasian land mass) conducted initially in a conventional mode—*speed* is absolutely vital and with it, tempo, that is, flexibility and agility of action which can develop opportunities and build up advantage upon advantage. Both the tank troops and the motorized rifle (MR) forces of the Soviet Ground Forces are under no illusions about the requirement for speed and the attainment of proper tempo, but the problem remains—how to do it?

Even more important—and a fact but little recognized in Western circles—the Soviet aim of "battle" is to avoid further battles (as Dr. Steven Canby has so pointedly analyzed) and "the battle" is but a means to transmit to "operational maneuver" which will break the will and cohesion of the enemy, resulting in military collapse—and hence political dissolution.

The problem, therefore, is how to overcome NATO's defense, in particular the antitank (AT) defense. In a nuclear mode, even if the weapons are used by NATO itself, Soviet nuclear strikes will account for an appreciable element of NATO's AT defenses; the main task under such circumstances would be to reconstitute Soviet forces and to operate over a nuclear-ravaged battlefield.

Without the use of nuclear weapons, NATO's AT capability remains (in the Soviet view) quite formidable, both in weapons and techniques: modern antitank guided missiles (ATGMs) outrange the tank's own gun, and mobile AT defense can be established quickly using ATGMs. The ATGM and the dug-in tank are not conspicuous targets and as Marshal Grechko pointed out after 1973, tanks and *BMPs* are at risk at longer ranges and even greater risk as they close with the defenses.

The overall improvement in tank guns has contributed substantially to increasing the tank's own antitank capability, but the most presistent danger is NATO's ability to set up obstacles—barriers/demolitions—as well as seeding *mines* remotely to reach within the depth of the attacking forces. Most ominous from the Soviet point of view is the projected mobile antitank brigade within the *Bundeswehr,* consisting of



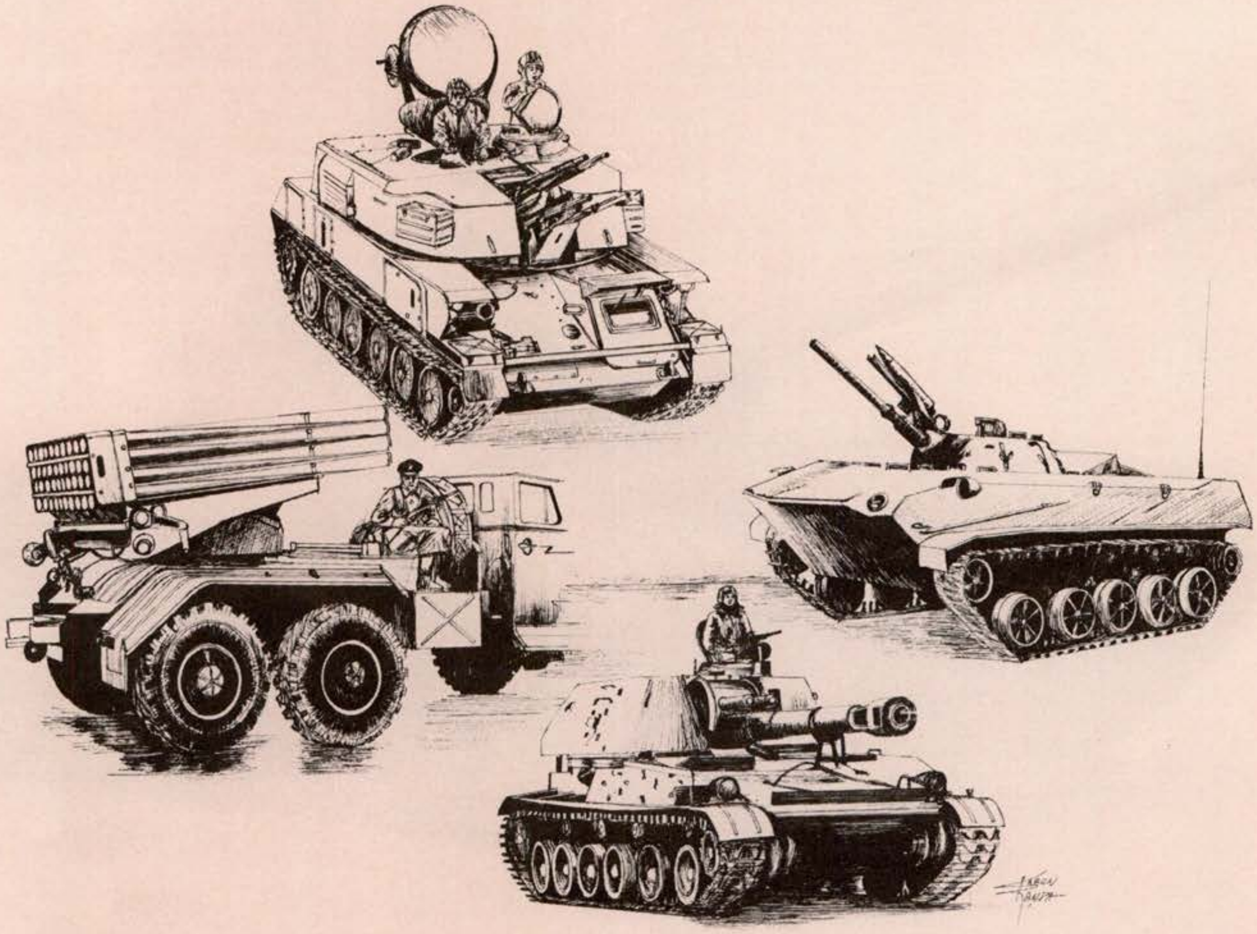
ATGM vehicles. combat engineers to set up obstacles, multiple rocket launchers (MRLs) for remote mining, tank and artillery elements for counterattack, and helicopters equipped with ATGMs. The U.S. Army's antitank helicopter brigade must also be counted in, with due recognition of U.S. exercise claims that at 2,500 m the TOW helicopter has an 8:1 superiority over the tank, but even more noteworthy is a projected *Bundeswehr* plan for a high-mobility helicopter brigade with 800 machines designed for counter-breakthrough operations. The threat posed by fixed-wing aircraft strikes against massed armor is not taken too seriously, for the Soviet view seems to be that this would be wholly wasteful in terms of resources, save for rocket attacks on tanks concentrating to the rear.[1]

The Soviet Commander's Options

The Soviet commander is thus presented with a series of options relating to NATO's defenses, particularly the antitank defense.

The Nuclear Option. While the use of battlefield nuclear weapons can eliminate whole groups of enemy forces and can adjust the correlation of forces in favor of the attacker, smashing the defense and shattering the defender's morale, NATO's use of nuclear weapons can also affect the Soviet Ground Forces very substantially. Most important, nuclear weapons cannot of themselves solve the AT problem, if only because they cannot be used in close proximity to friendly troops and will therefore leave the forward edge of the defense—still able to blunt any attack—intact. Here we come back to the Soviet view of conventional weapons assisting nuclear strikes, for in the case of AT defenses conventional weapons would be absolutely essential to complete the suppression. (I can quite see the logic of the call by a number of younger Soviet commanders to accelerate the advance by the use of tactical nuclear weapons, but they too must be aware of the limitations of tactical nuclear use and will probably fall back on the propositions advanced by General Zavyalov on the interrelation of nuclear with conventional weapons, a kind of military symbiosis—there is no single nuclear solution).

The Artillery Option. The role of artillery is at all times vital, but its importance is, if anything, increased when nuclear weapons are not used. Artillery is considered to be *the* prime weapon for suppressing antitank defenses apart from the tank itself. Artillery tasks include the suppression and destruction of enemy nuclear means, AT weapons, and the destruction of antitank obstacles and detonation of minefields. Artillery will also support assault formations to the whole depth of the enemy defenses and suppress enemy antitank reserves (holding off any counterattack) as well as providing flank protection. The main impact of the fire will be directed against NATO *platoon strongpoints* where AT weapons are immediately concen-



trated.

Tactical Air.[2] Tac air will be used to strike targets deeper in the rear of the enemy defenses, particulary mobile targets and concentration areas, with fixed-wing aircraft assigned to deep strike missions and helicopters operating closer to the FEBA. The helicopter gunship (*Mi-24s*) will also provide close air support for assault units as opposed to fixed-wing aircraft

ATGMs. ATGM vehicles will be deployed well forward, just at the rear of the first assault echelon, not least to be able to block any enemy counterattack. *Study of the terrain* is essential, including knowledge of their own deployment areas, locations of enemy armor, and coordination with assault units. ATGMs can also cover the introduction of the second echelon by engaging enemy targets at long range and thus within the depth of the enemy defenses.

Small Arms/Tank Gun Support. Once closing on the enemy positions, small arms fire must take over with the termination of the artillery barrage—and there is the problem of the recovery from the effects of artillery fire (tank crews can recover within 30 seconds, though they may be badly shaken up) and ATGM crews can be ready to fire within 1 minute (or 2 minutes at the most). Closing on the defenses means in the final stages of the assault encountering the *heaviest density* of light AT weapons, thus exposing the *BMPs* and APCs. Infantry dismounted 200-300 m from enemy strongpoints use small arms fire to cause enemy defenders to "get their heads down" and provide some protection for the advancing armor.

Tactical Handling

All this brings up the question of *tactical handling*, a very vexing question which has been extensively debated in Soviet military circles. None seems to dispute the need for continuous and effective fire on enemy strongpoints—artillery, tac air, and/or nuclear strikes, followed by the heavy weapons of the assault echelons and in the final phase small arms and machinegun fire, with artillery and mortar fire continued until the *last possible moment*.

Tanks and *BMPs* exploit breaches in the defense with the utmost speed, pushing into gaps or breaks and advancing at the best possible pace into the depth of the defenses, bypassing strongpoints and avoiding time-wasting assaults. Minefields must also be cleared with great speed and battlefield obstacles demolished by combat engineers, this same "sweeping" technique being applied *throughout* the depth of enemy posi-

tions. Two other requirements also stand out plainly: first, to use terrain—the ground—in the manner prescribed ever since the 1950s, to seize favorable terrain wherever possible; and, second, to select the line of the "main blow" in relation to careful study of the weaknesses of enemy defenses, ensuring that a "weak spot" is genuinely weak and not merely the site of an ambush.

Artillery support is the true "powerhouse" of this offensive form, with suppressive fire reaching well into the depth of enemy defenses, with resultant problems of coordination—shades of the "Great Patriotic War." A NATO battalion will have at least 15 weapons with a range of 3,000 meters, hence the need to fire deep as well as suppressing AT weapons at the forward edge. When within range, tanks and infantry combat vehicles add their fire complement by *direct fire.* In line with standard Soviet practice, expenditure of artillery rounds has been transferred into "norms"—*normalizatsiva*—for the reduction of strongpoints[3] in terms of suppressive fire that is, sufficient to put over 30 percent of AT weapons and their crews out of action.

"The tanks and BMPs, relying on their speed and their own firepower, are committed to breaking into the defenses to the greatest possible depth and preventing any consolidation of the defense."

This raises very important questions about the availability of the requisite amount of artillery and the "survivability" of artillery—both of which are stoutly affirmed by Soviet artillerymen. However, there is an obvious Soviet weakness, unless a sufficient quantity of artillery is present, in the face of NATO counterbattery fire.

Another problem centers on the *time factor,* which is to say that the artillery may be critically short of time both to plan and to execute its preparatroy fire, particularly in a rapid attack. For example, with a battalion in the meeting engagement the artillery has very little time in which to plan, deploy, and fire (even assuming that all the artillery is actually on hand, protected, and with targets duly acquired).

The tanks and *BMPs* rely on their speed and their own firepower, committed to breaking into the defenses to the greatest possible depth and preventing any consolidation of the defense. Soviet tanks will engage enemy tanks, ATGMs, and mobile antitank guns in sequence, while small arms fire is directed against ATGMs, followed by light AT weapons, enemy infantry, and artillery and/or mortars. Dug-in tanks will be engaged at long range by salvo fire from Soviet tanks, groups of three to four tanks firing at ranges up to 2,500 m or an entire company salvo at longer ranges.

Once into the enemy defenses tanks and *BMPs* also deploy to check possible counterattack (thus they incorporate drills to hold defensively even in the course of an offensive, for AT defense has long been an object of Soviet concern as well as "holding" the expected counterattack). Tanks will normally lead, followed by *BMPs* or *BTRs,* with dismounted infantry closing to 200 m of the tanks and using their small arms to deal with close-range antitank weapons. Judging by photographs of Soviet exercises, a squad of riflemen can be mounted on the tank itself to deal with the close-in threat.

Air Defense

Mobile battlefield air defense systems will provide cover to the assault, but this protection is at its *weakest* 3-4 km from the FEBA—with the threat posed by low-flying aircraft and the antitank helicopter. Fighting helicopters has become an urgent task, for the helicopter can attack without entering the main antiaircraft (AA) defense area and launch a very low level surprise attack. The Soviets concern about helicopters is evident as noted in these statements:

"Helicopter combat is becoming a component of the modern combined arms battle which may be fought either in cooperation with the ground forces or independently by helicopter subunits or individual helicopters."

> ". . .timely determination of helicopter-threatened directions, maximum advancement of the radar barrier toward the enemy, and choice of positions for AA weapons with small closure angles as close as possible to sub-units to be protected are of great importance.
>
> ". . .it has become vital to get a weapon which could compete with the helicopter in respect of combat power and tactical possibilities. Logic and historical experience suggest that such a weapon is the helicopter itself. . .like tank battles of the past wars, a future war between well equipped armies is bound to involve helicopter battles."

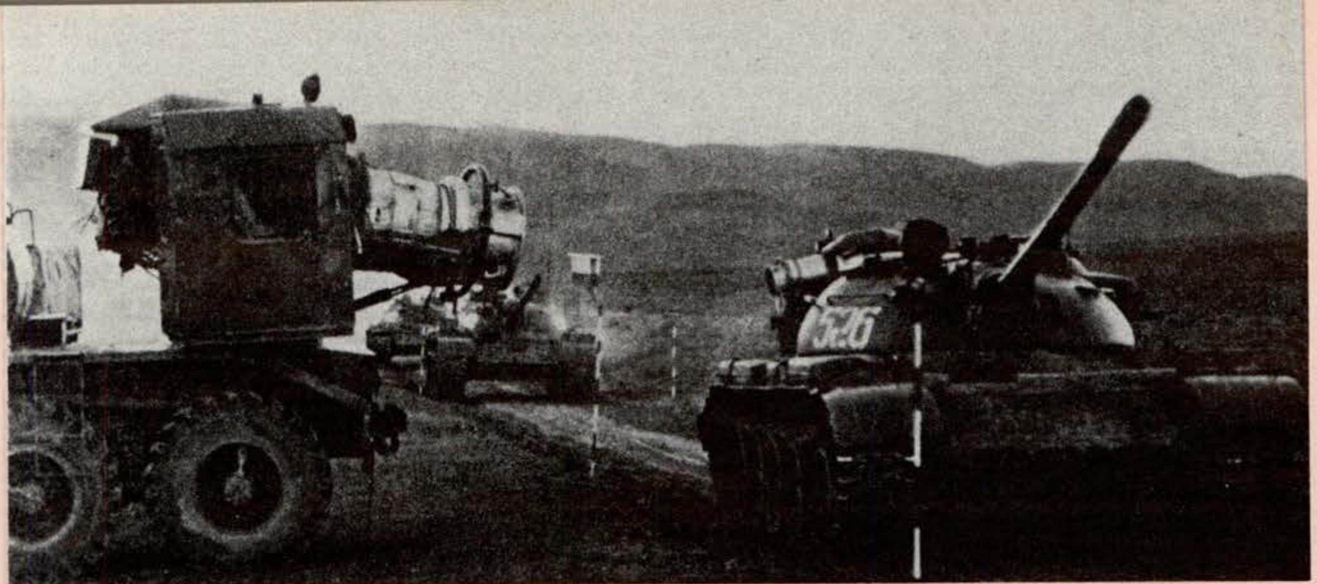
Helicopter combat is thus becoming a component of the modern combined arms battle which may be fought either in cooperation with the ground forces or independently by helicopter subunits or individual helicopters.[4]

Debate on Combined Arms Action

The debate on the complexity of combined arms action has been both protracted and heated. The artillery claims to be able to carry though "reliable suppression" of enemy fire means (including AT weapons) but out of sheer practical necessity Soviet commanders remain skeptical (and certainly Soviet artillery has been exhorted to improve its battlefield performance). The dismounted attack will carry infantry through enemy defenses, but undamaged enemy "fire means" can still inflict heavy losses on the *BMPs* (possibly the armor also) and the infantry itself will be exposed to the destructive fire of enemy artillery, small arms, and antipersonnel mines. Suppressive fire also means a long "pounding" which gobbles up not only precious time, but also ammunition. The suppression of AT defenses requires coordinated action but the main burden falls on the artillery whose "survivability" is open to some doubt.

"The suppression of AT defenses requires coordinated action but the main burden falls on the artillery whose 'survivability' is open to some doubt."

The *tankistyi* are not entirely satisfied. Their chief complaint is directed toward the dismounted infantry attack, since dismounted MR troops (sometimes unnecessarily dismounted) will be at some distance from the attacking armor and thus deprive the tanks of support during the close of the combat phase and at the very moment when tanks are facing "the prin-



cipal mass" of enemy AT weapons.

At the same time, bringing tanks and MR troops together simultaneously at the forward edge of the defensive system means slowing down the tanks, thus "intentionally limiting their combat potential." The tank argument is that under all circumstances the attack should be speeded up, exploiting the speed of the tank and the *BMP*. Now the new *T-64/T-72* battle tank can certainly keep pace with the *BMP* (a shortcoming of the earlier *T-62*, which could be outdistanced).

One of the Soviet answers is to place more emphasis on *maneuver*, though this should not be confused with either mobility or more movement. Maneuver should be employed at "the very beginning of the offensive" rather than being confined to the post-breakthrough phase, though this brings the whole argument back to coordination and introduces yet another reservation that maneuver itself might contribute to

"Since maneuver takes some time to prepare and execute, it must by definition slow the offensive and literally waste time."

'slowing down' the attack. Why not just high-speed movement in its own right? Could "maneuver" not be read simply as "preemptive assault"? Since maneuver takes some time to prepare and execute, it must by definition slow the offensive and literally waste time. The dogmatic answer returned to this is that "maneuver is one of the key factors contributing to a high rate of advance."

The notion that the highest rate of advance can be effected along straight lines with battle formations adopted at the beginning of the engagement, "moving rapidly forward in a body without delay," is precluded by the very irregularity of the modern battlefield—where there must be *maneuver with fire*, considerable depth of action, and maneuver designed to maintain "continuing superiority over the enemy in manpower and equipment." The full combination must be completed with *maneuver, firepower,* and *assault* in order to attain a decisive outcome.

Command and Control

We can now approach the basic question of how combined arms combine, making an important distinction between levels, namely, *formation* and *unit*. It will be readily seen from the description of tactical handling at regiment/battalion level that a *second echelon* is well nigh essential to ensure the smooth phasing of coordinated actions: in fact, regiment/battalion operations can scarcely be handled without echeloning. However, at formation level (army/division) and assuming that the first Soviet preference is *not* for the heavy breakthrough operation, the *single echelon* attack is more appropriate and thus the "combined-arms reserve" is that which is most needed.

The distinction is not mere semantic quibble or academic nicety. It should be noticed that in much Soviet military writing there is a great deal of "adjustment" between the use of "second echelon" and "reserve" (which is no accident, for Soviet military men well understand the status of "second echelon" and "reserve" all too precisely). Even if we are talking about a "second echelon" in the orthodox sense at army level, Soviet doctrine insists that such elements should be held back during the conventional phase in order to be used as an exploitation echelon as and when nuclear strikes are launched: nor will the "second echelon" take the traditional form of a field army (or armies) as such.

We should then ask what form it will take—one likely answer is that of high-speed combined-arms intervention forces, perhaps on the example of the Baltic Military District (MD) with its tank forces on low-loader transporters and its facility to move divisions as "combined arms reserves" or flexible reinforcement to first-echelon formations. As Dr. Canby pointed out, since the Soviet command cannot predict the location of their successful thrusts and since success *alone* is reinforced, then they cannot know where the "second echelon" will be committed.

This disparity, or disjointing, is also readily apparent when dealing with the *tank*, which at the unit level (regiment and

". . . the tank does not need, indeed it can positively do without the encumbrance of combined arms and all supporting elements, if only because these reduce the speed of advance that is essential to successful tank operations."

battalion) cannot operate without the combined arms apparatus in order to ensure its own survival and effectiveness. But at the formation level—army/division, particularly army—the tank does not need, indeed it can positively do without the encumbrance of combined arms and all supporting elements, if only because these reduce the speed of advance and the rapid reaction time essential to successful tank operations.

This brings out the present Soviet dilemma very clearly and

here the argument boils with some visible agitation: the tank army versus combined arms. The armored commanders are critical of the motorized rifle (MR) elements which only hinder "true" tank operations, while MR commanders and the proponents of combined arms operations as such hint at the eventual demise of the tank army. The late General Radzievskii, however, made no bones about this—the role of tank armies was to act as "true" tank armies, for tank formations could not only survive on the battlefield but generate their own "sustained combat capability."

This, in a sense, turns the concept of combined arms on its head, for that operational method and organization becomes only a means to sweep the defenses aside in order to allow the armor to cut loose. While that view is demonstrably extreme (though not an isolated opinion), the power of the armored formation is expressed also in terms of a resort to a form of mass on the battlefield, with combined arms formations supported by artillery and tactical air—in a conventional mode—attacking across a broad front, to be followed by large tank formations acting as an "exploitation echelon" (as they did in the great Patriotic War, or as the front/army "mobile group"), moving through gaps and weak points in the defenses (already identified or opened up by the first assault wave) and racing deep *with all speed* to the full depth of the enemy defenses—to operational and strategic depth—in an effort to pull down the whole defensive system.

"Perhaps the chief value in looking at the Soviet combined arms concept is to induce caution about believing that there is only one main type of operation—the heavy breakthrough and the orthodox echelon patterns."

Even at the "centralized" army/division level, there is sustained and intense discussion about the integrity of the combined arms mode. Once at the "decentralized" level—regiment/battalion—difficulties certainly proliferate. Much of the coordination/interaction centered at division has now been "decentralized" to *regiment,* particularly the *BMP* regiment, where the regimental commander must integrate maneuver elements, fire support, and logistics, as well as controlling the attached units (a tank battalion, air defense units, support), while he must also coordinate the aerial fire support of helicopters, react to time-sensitive reconnaissance information, move large columns at high speed, and also detach subunits for flanking maneuvers.

Going further down the scale, the commander of a reinforced MR battalion is even harder pressed, for he is under severe time constraints and without any appreciable staff. The net result has been for the Soviet command to reduce tactical complexities to several set drills and a fixed tactical repertoire, which may control the situation to some degree but also robs combined arms of its main dynamic properties, with the emphasis on *speed* and *surprise* above all else in order to maximize *shock power.*

There are, of course, other constraints upon Soviet performance within the combined arms context, not the least being the whole complexity of managing the interactional process (*vzaimodeistvie*).[5] Prominent factors are:

- The ill-concealed misgivings of the tank commanders about waiting on full fire suppression and having to absorb the delay (and danger) involved in the dismounted MR attack.
- The effectiveness of artillery, which has a key role, with a ready recognition of the advantages of direct fire but attendant difficulties with the decentralization of artillery resources.
- The coordination of artillery with tac air strikes and/or helicopter gunship support.
- Reliability and speed of target acquisition.
- Air defense (particularly against very low-level air attack and helicopter surprise attacks) up with the lead/forward assault elements.
- Tac air support in the regimental area.
- Protection of soft targets (combat engineers and artillery) deployed well forward.
- Excessive reliance on forces in immediate contact and on reconnaissance elements for both surveillance and target acquisition.
- Inflexibility (and even misuse) of communications.
- Loss of ability to control a rapidly changing situation especially at subunit level.
- Mastering the intricacy of flank maneuvers, particularly in the *meeting engagements.*

In both offensive variants—the classic *breakthrough* on the lines of operations in the Great Patriotic War and the *meeting engagement*—the combined arms mode is deemed to be indispensible. In a sense, this has come to be used as a general formula and as a means of identifying particular "teams" (tank-infantry, tank-BMP-helicopter, artillery-tac air) but *not* as a resolution of a basic argument about how to attain decisive operational success in the shortest possible time. Perhaps the chief value of looking at the Soviet combined arms concept is to induce caution about believing that there is only one *main type* of operation—the heavy breakthrough and the orthodox echelon patterns—(an assumption which permeates the U.S. Army's *FM 100-5 Operations*) when something else is brewing or could be brewing.

Footnotes

[1]For full details, see Colonel A. V. Tonkikh, *Preodolenie protivotankovoi oborony,* Moscow, Voenizdat, 1978 (2nd Edn) with diagram of US Army/Bundeswehr battalion/brigade defensive deployments, weapons characteristics: Chapter 3 goes on to examine the means available to an attacker to overwhelm AT defense. It is worth noting that this 2d edition has been a long time in making its appearance (1976-78, almost 2 years before it was cleared for open publication). Under the new equipment plans, the *Bundeswehr* will have *5,000 battle tanks:* the Germans appear to be shifting towards fighting a *true* armored war, with provision for mobile counter-breakthrough resources and, *above all, operational reserves.* Essential reading here is Dr. Canby's study, *A Comparative Assessment of the NATO Corps Battle (1978).*

[2]See Captains F. Ricardelli and Captain Gary L. Jackson, U.S. Army, "Soviet Close Air Support: An Indispensable Comrade in Combined Arms Operations," *Military Review,* May 1979, pp. 11-20.

[3]On artillery "norms," see E. K. Malakhovskii, *Strel' ba na porazphenic opornykh punktov,* Moscow, Voenizdat, 1978 (112 pp.) and also V. Ya. Lebedev, *Spravochnik ofitsera nazemnio artillerii,* Moscow, Voenizdat, 1977 (A Handbook for Battery Commanders).

[4]See Colonel M. Belov, "How to Fight Helicopters," *Soviet Military Review,* 1979, No. 9, pp. 18-19. A very authoritative article from one of the great Soviet protagonists of the helicopter and "air mobility." (The adaption of the Mil Mi-24 to an air-to-air as well as air-to-ground role seems to be a provision already for the "helicopter battle" envisaged by Colonel Belov). A most excellent survey and analysis is to be found in Lt. Col. Lynn M. Hansen, USAF, "Soviet Combat Helicopter Operations," *International Defense Review,* 1978, No. 8, pp. 1242-1246.

[5]For a detailed discussion of *vzaimodeistvie,* see D.A. Ivanov *et al, Osnovy upravleniva voiskami y boyu,* Moscow, Voenizdat, 1977 (2nd Edn.), pp. 290-302.

Developing Tomorrow's Combat Vehicles

Colonel Lawrence B. Fitzmorris

The Armored Combat Vehicle Technology (ACVT) Program is designed to use the results of testing with experimental test beds to determine requirements for new weapons systems. The program objectives are to determine appropriate Army and Marine Corps courses of actions regarding the development of lightweight combat vehicles and a medium-caliber, antiarmor automatic cannon. The Training and Doctrine Command (TRADOC), Materiel Development and Readiness Command (DARCOM), and the Marine Corps are partners in this endeavor.

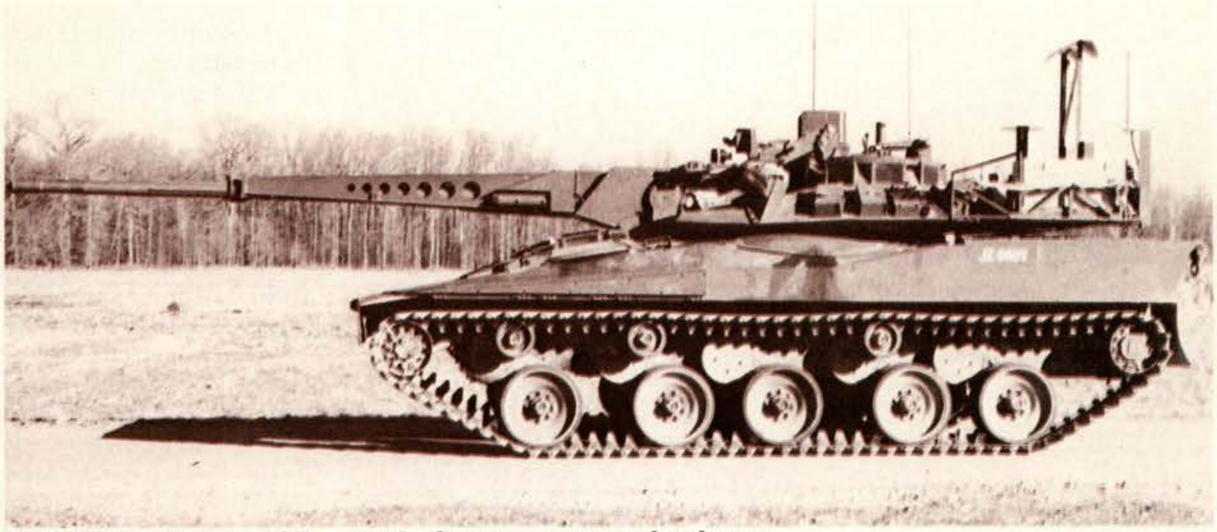
The program philosophy is to allow requirements for future weapons systems to be derived from user judgments that are based on analysis of hands-on experience with new technology, rather than from "pie-in-the-sky" user "wish lists" or highly optimistic industry "promises."

The program has extended the state-of-the-art in weapons system and vehicle technology by using experimental test beds; in instrumentation technology by developing the means to measure the performance of these test beds; and in the development of engineering and combat models for portraying the characteristics of future weapons systems. The program is having success as well as problems in all these areas.

So far, no problem has been insurmountable. However, as experienced hands know, extending the state-of-the-art often results in scheduled slippages, and the ACVT Program is no exception. In this case, the schedule originally called for much of the program to be nearing completion. However, another year and a half of testing and analysis is required.

The ACVT Program has undertaken a series of tests designed to address technology issues identified by the program objectives.

The *HIMAG (High Mobility-Agility) II A Test,* also known as the *El Camino Test,* conducted in 1977 at Fort Hunter-Ligget, California,



measured the effects of target mobility and agility on the hitting performance of antitank systems. In this test, gunners of *M-60A1* tanks and TOWs mounted on *M-113s* tracked and dry fired at highly-evasive targets maneuvering on an airfield runway. Results indicated a definite and significant payoff for agility against tank gun systems, as well as a demonstration that innovative training can substantially improve gunner skills and performance.

The *Seating Position Test,* conducted in 1977 at Fort Knox, was an attempt to find a way to lower vehicle silhouette. The program examined a supine, or reclining, posture and a prone posture which were compared to normal upright seating for armored vehicle crewmen. The prone position was medically and physically unsatisfactory, while the supine position was determined to be comparable to the upright seated position in terms of crew performance.

The *HIMAG Chassis Test,* conducted at Fort Knox and Vicksburg, MS in 1978-79, used a variable-configuration test bed vehicle to gather engineering data on high-performance tracked vehicles. The HIMAG chassis is the Army's first variable tracked research vehicle and was the ACVT program's first experience with a highly-instrumented test bed. There were severe reliability problems in automotive and instrumentation areas that plagued the test schedule and events. In more than three-fourths of the available test days, some form of repair was required. However, all required tests were completed successfully.

The HIMAG chassis was compared to several standard vehicles and other experimental vehicles in an operational 20-km *Cross-Country Mobility Traverse Test* to determine to what extent vehicle speed would be limited, and to determine if the speed limitation would be caused by the driver or by the vehicle.

Chassis test results show that considerable improvement can be achieved in tracked vehicle cross-country ride characteristics, agility, and speed, by improvements in suspension systems and power trains, and that such improvements are well within the state-of-the-art. It was also learned that drivers will use most or all of a vehicle's mobility capabilities, even at high-performance levels.

In examining the *HIMAG II A* results, it was realized that gunners might not be able to track and hit targets in real terrain as well as they did on the airstrip at Fort Hunter-Liggett. Therefore, the same type of test was conducted in more realistic terrain that included breaks in target intervisibility. The courses for this *Hit-Avoidance Test* were designed to determine the effects on the gunner's lay, tracking, and firing capability when intervisibility is lost or regained across varying segment lengths. Intervisibility and nonintervisibility segment lengths of approximately 50, 100, and 200 meters were selected to span the spectrum of intervisibility conditions in a variety of locations throughout the world.

Target tracking systems included

M-60A1 tanks; tracking both with and without lead, the latter simulating a perfect linear lead computer; the GM candidate for the *XM-1;* the Soviet *T-62A*; and the *Stinger Alternate,* an advanced missile system. Six different target vehicle paths were used and gunners conducted dry-fire engagements at different time, independently of the other firing vehicles.

The target vehicles were an *M-60A1* tank, moving at speeds up to 20 mph, and a hot rod *M-113* specially modified with two *Chrysler 440* racing engines by the U.S. Army Corps of Engineers Waterways Experimentation Station. This vehicle previously set a world tracked vehicle speed record of 77 mph. In this particular test, however, its average cross-country speeds were between 30 and 40 mph.

Each gunner was told to fire whenever he felt he had a proper sight picture. A device was added to each tracking system that covered the gunner's sight momentarily after trigger pull to obscure his vision, simulating the obscuration which would occur from the smoke, dust, and flash of firing the main

Table 1. Characteristics of AAI's HSTV-L

General

Weight	20 t (17 mt)
Height	96 in (2.4 m)
Width	110 in (2.8 m)
Length	229 in (5.8 m)
Speed	50 mph (80 kmph)
Crew	3

Engine

Avco Lycoming. Turboshaft, 650 hp.

Transmission

Allison X-300-4A. 4 forward, 1 reverse, with pivot steer.

Suspension

National Water Lift Company. Hydropneumatic. T-138 track—same as used on the M-551 Sheridan.

Fire Control

Texas Instruments. Electronic computer with 3 levels of operation; Raytheon CO^2 laser rangefinder.

Sight

Texas Instruments. Stabilized, day TV, thermal (forward looking infrared). Linked to all 3 crew members.

Turret

Cadillac-Gage. Stabilized. Elevation: -14 to +45° at 57° per second. Traverse: 360° at 57° per second.

Armament

ARES. 75-mm high-velocity, automatic cannon. M-240 7.62 coax machinegun and M-240 7.62-mm machinegun at TC's station.

gun.

Because the slower *M-60A1* was visible as a target for a longer period than the hot rod *M-113,* the gunners fired many more shots against the *M-60A1* target than they did against the hot rod *M-113.* The gunners also had much more difficulty tracking and engaging the more agile, evasive vehicle. How often would they have hit the targets? One can make a guess, but the data is still being analyzed because of an unpleasant aftereffect of highly-instrumented testing. The test was run in the fall of 1978, and reduction of data is just now being completed, which includes reducing nearly 1¾ million frames of film.

Preliminary indications are that individual hit probabilities in the *Hit-Avoidance Test* will be somewhat lower than *HIMAG II A Test.* When the final analysis is completed, it will be possible to answer these questions as well as being able to make comparisons between the quasi-tactical performance of gunners trained by the U.S. Army Armor Center and the Combat Vehicle Technology Directorate's Evasive Target Engagment Techniques.

If one thinks about conducting a 2,000-meter attack with a highly agile vehicle rather than a slower tank, it is easy to foresee the likelihood that defending antitank guns will fire fewer shots, with reduced hit probability, contributing to a significant payoff in battlefield survivability. However, survivability is only part of the equation. To be successful in battle, it is also necessary for combat vehicles to deliver knockout punches.

Last summer at Soccorro, NM, Ballistics Research Laboratory (BRL) completed, under the auspices of this program, one of the most extensive main gun firing programs against real tanks and APCs since the 1950's. The results of 75-mm lethality tests against lightly-armored vehicle targets showed that the 75-mm KE was not very effective in terms of damage (pressure and temperature effects minimal), but that the 75-mm HE was effective. Against other targets, the 75-mm HE was effective against bunkers and moderately effective against buildings. The test results against tank targets are classified, but in general, the 75-mm APFSDS performance generally matched the predictions of BRL.

The *HIMAG Full-Up System Test* (FUST) will contribute to a data base for analytic models. This will be done by characterizing the performance of the automatic cannon and stabilization systems on the HIMAG and examining high-technology fire-control systems to see if a burst-fire cannon permits a combat vehicle to have a simpler and cheaper fire control. Several levels of sophistication of fire control and suspension performance will be tested in shoot-on-the-move situations. The capability of burst-fire cannon and high-technology fire control to hit low- and medium-performance aircraft will also be demonstrated.

With regard to improving the design of gunner's station for high-mobility vehicles, Human Engineering Laboratory (HEL) and Tank Automotive Research and Development Command (TARADCOM) are conducting experimentation as part of the ACVT program. The TARADCOM ride simulator is being used to obtain data that will allow optimization of visionics and gunner station hardware for shoot-on-the-move engagements at high-mobility levels. This experiment was started in February 1980 and will run through the summer of 1980.

In addition to the HIMAG, the ACVT program has a second principal test bed, the High-Survivability Test Vehicle — Lightweight (HSTV-L). (See table 1 for vehicle characteristics.) With the HSTV-L, the program will examine the use of high mobility/agility and the automatic cannon in a lighter weight and more operationally configured vehicle.

HSTV-L testing will explore the ability of two- and three-man crews to perform their duties in a variety of environments, examine the contribution to target servicing of a hunter-killer fire control system, and gather engineering data peculiar to a vehicle of lighter weight (16-20 tons) than HIMAG.

HSTV-L has also experienced delays in development, though not so severe as HIMAG. Engineering tests are expected to commence at Aberdeen in May 1980 and the HSTV-L will move to Fort Knox in August for performance testing.

The delays in hardware and instrumentation availability mentioned before have not been unexpected. Uncertainties and risks are associated with any high-technology endeavor. The challenge is to accept them early enough to be able to deal with them. This is better than pursuing a "success only" philosophy that ultimately results in a succession of "fire brigade" actions and a magnified effect on schedules and resources.

This program highlights the need for early, candid sincerity on the part of all participants, government and contractor alike, rather than

merely assuming results and pronouncing forecasts derived through rose-colored glasses.

The *Advanced Antiarmor Vehicle Evaluation Test* (ARMVAL) is being conducted by a Joint Test Directorate, rather than by the Combat Vehicle Technology Directorate (CVTD). However, it has a role in the ACVT program. ARMVAL is a series of force-on-force experiments in which the Army and Marine Corps, through the use of surrogate lightweight, armored combat vehicles and real-time, casualty-assessment instrumentation. The Combat Development Experimentation Command will conduct the test at Fort Hunter-Ligget with the objective of sorting out doctrinal, tactical, and organizational issues.

The Army's principal interests in ARMVAL are the command and control implications for units equipped with highly-mobile vehicles that use evasive tactics.

The ACVT Program study effort uses the data base generated by the HIMAG and HSTV-L tests and other testing and experimentation to provide a basis for estimates of the performance characteristics of conceptual vehicles we might want to field in the late 1980's. The enormous amount of data generated by these highly-instrumented tests will be reduced and analyzed to provide, as quickly as possible, insights into test results and data for various engineering and combat simulations.

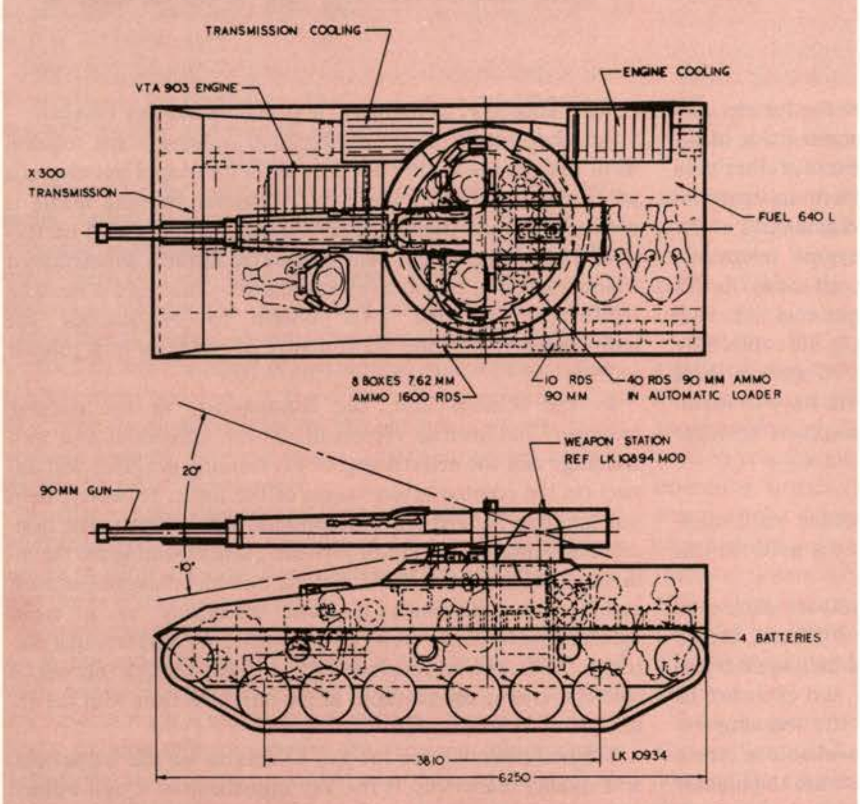
A drawing of an ACVT Concept Vehicle is shown in figure 1. Possible roles for these types of lightweight armored combat vehicles are:

- Light tank in light divisions (includes replacement of *M-551* Sheridans in 82d Airborne Division).
- USMC mobile, protected weapon system.
- Follow-on to Improved TOW Vehicle in infantry units.
- Replacement for main battle tank in cavalry units.
- Cavalry vehicle (follow-on to Cavalry Fighting Vehicle).
- Infantry carrier (follow-on to Infantry Fighting Vehicle).

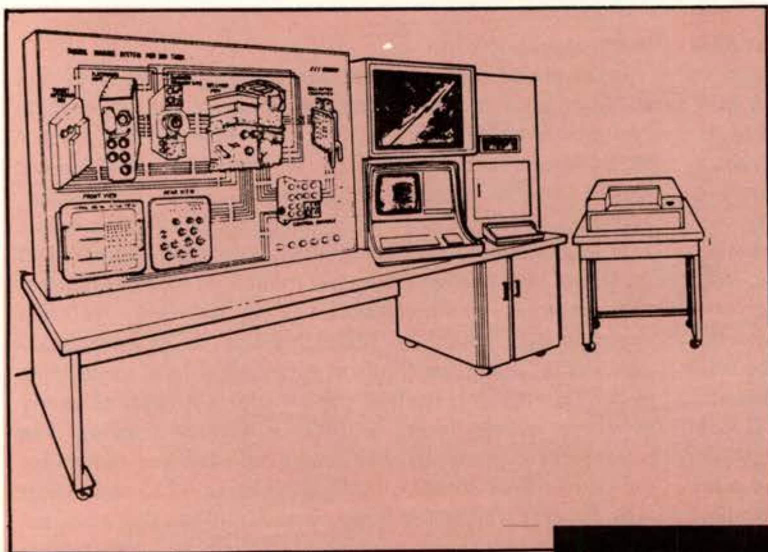
The worth of lightweight armored combat vehicles and the automatic cannon will be evaluated by assessing all benefits and burdens germane to a procurement decision. These benefits and burdens include performance capability, logistics, impacts, production cost, etc. Additionally, we are in close contact with the XVIII Airborne Corps and Headquarters Military Airlift Command in looking at strategic mobility benefits. Vehicles which are judged "best" among ACVT candidates based on examination of benefits and burdens will then be studied in the more traditional force-on-force context.

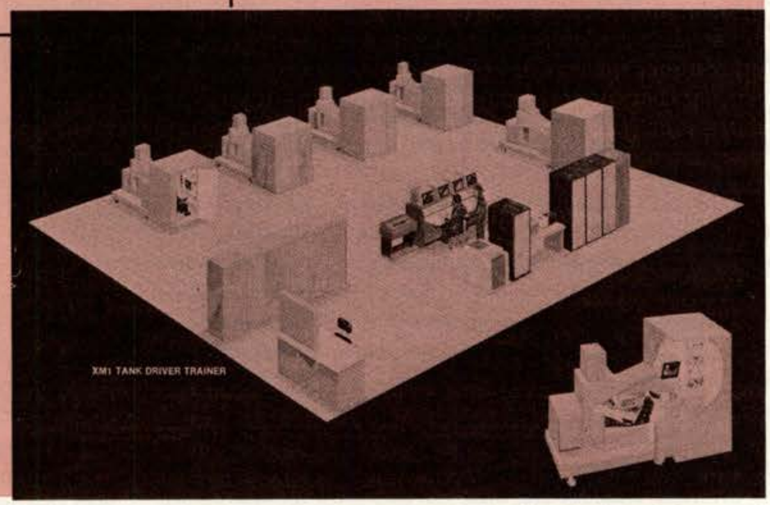
To do this, several of the Army's combat simulations, such as the Army Materiel Systems Duel model and TRADOC Systems Analysis Activity's *Carmonette,* are being modified to portray technology characteristics peculiar to lightweight, armored combat vehicles and a burst-fire cannon, such as the effects of target agility on a firer's hit performance.

The synthesis of testing and analysis unique to this program should enable the Army and the Marine Corps, better than before, to determine what should be done about technology for lightweight, armored combat vehicles and medium-caliber, automatic cannons. It will also provide insights as to the value of experimental test beds as tools for determination of requirements.



COL LAWRENCE B. FITZMORRIS is the director of the Combat Vehicle Technology Directorate, U.S. Army Armor and Engineer Board, Fort Knox, KY. A distinguished military graduate of Loyola University, he holds a bachelor's degree in chemistry and a master's degree in public administration.





Evaluation Program. This has been achieved by using subcaliber training devices to simulate the main gun round and the development of scaled ranges to allow training in gunnery procedures at the local training area. It is not an ideal solution since the total system cannot be exercised, but it is a solution to the problem of training resource constraints.

So far, only the constraints facing the Active Army have been discussed. In the Reserve Components, the constraints are even worse. Time to train, restricted area training problems, availability of local training areas, and lack of currently developed training devices are but a few of their problems. Add crew turbulence and associated cross-training requirements to these problems, along with other constraints, and Reserve Component training becomes an impossible task—now and in the foreseeable future.

Training Problems

Today's training requirements and constraints imposed by the real world pose problems for the combat developments community as well as the training developers.

At the apex of today's problems is the fact that training developments lag far behind the combat developers. A look at the *M-60A3* tank currently being fielded as well as the *XM-1* main battle tank and *XM-2/-3* infantry and cavalry fighting vehicles, reveals several excellent examples of this lag. A case in point is the fielding time frame for the combat vehicle system versus the fielding of a supportive training device such as the unit conduct-of-fire trainer.

This trainer is a simulator which will provide training on the critical tasks performed by tank commanders and gunners. It will be used in garrison to provide sustainment gunnery training without expenditure of training resources in either the local or major training area. Although this sustainment of combat skills is critical, the unit conduct-of-fire trainers will be fielded far behind the combat vehicles. The *M-60A3* tank is being fielded now, but the complementary trainer will not be fielded until FY 83. The *XM-1* main battle tank and *XM-2/-3* fighting vehicle systems will go to the field in FY 81; but the conduct-of-fire trainer will again lag far behind, with first production models optimistically scheduled in FY 83 and FY 85 respectively.

These facts defeat a total system approach. When a new combat vehicle system is conceived and initial plans are made for development, the combat vehicle is designed to meet the threats imposed by modern-day battlefields. So too, the combat and training developers need to concern themselves with the individuals who will make the combat system effective on the battlefield. In addition to human factors considerations, the combat and training developers need to get involved early to assess the training environment and its impact on the design of the combat system. Remember that the recruit of today is the noncommissioned officer of tomorrow. What good is a combat vehicle that, on paper, can meet the demands of the modern-day battlefield if personnel cannot be trained on the subsystems? The combat and training developers need to start talking early and take a total system approach to design and

development. This will insure that we are able to fight the system which is developed to win the first battle.

In the past and currently, this lag has caused the training community to develop training devices and simulators as a fix for today's training limitations. This is not to say that training devices will not be a part of the total system package. Increasing emphasis has been, and will continue to be, placed on the use of simulation, simulators, and devices in solving combat vehicle training requirements.

Used as part of our training strategy, devices and simulators can counter the realities of the Army's dimishing resources as well as improve the quality of training through innovative technology. We are presently fielding subcaliber and laser devices which will reduce main gun ammunition requirements for individual training. Projected training devices and simulators will allow us to shift the training emphasis from the individual and single combat vehicle crews to the collective training of platoon and company gunnery by the end of the 80's.

We must be careful, however, in our strategy of integrating training devices and simulators into the training subsystem. Training devices and simulators developed to address today's training limitations have inherent problems. The subcaliber devices developed thus far are strictly for procedural training. In order to conduct training for the total system, the simulators presently being developed will have to be highly sophisticated with high fidelity. This type of total system resolution is achieved at extremely high cost in initial investment and in logistical support when the system is fielded. We seem to lack a choice of viable training alternatives—we either use the major system or highly sophisticated and costly devices.

Another problem with current training devices is that training transfer is rarely, if ever, validated with hard data. We field a device based on a gut feeling that since it operates the same as the actual combat system or sub-system, that it obviously must be capable of training transfer and thus, be training effective. In the past, we fielded a TOW trainer that didn't train and are currently fielding a highly expensive tactical training system, (the Multiple Integrated Laser Engagement System—MILES), without any hard data to support training transfer or training effectiveness. Training devices and simulators are needed now, and in the future. We must insure by thorough analysis that it will support the training and combat developers requirements.

When setting up training device strategy, worldwide standardization of these systems must be emphasized. Today, there is a lack of this standardization. Not only must the total army in the field be using the same devices for the same job tasks, but, if possible, devices used in the institution should be the same as those used in the field.

Another area not mentioned so far is a fallout from the lag of training developers behind the combat developers. Skill performance aids are begun late in the system development program, but these manuals must be on board in quality as well as quantity for the individual soldier to be completely familiar with the operation and maintenance of his system. The total combat system will be only as effective as the soldier behind that system.

What we must admit is that the effect of problems and constraints is growing worse—faster. Once we recognize the limitations associated with today's training, we can take positive actions to correct the situations and provide a fully-ready, total, combat vehicle system to the force.

A Challenge to Industry

From previous remarks on the requirements, constraints, and problems of training today and in the future, it can be seen that there are tremendous challenges for industry. Here are the primary ones.

The key to the whole business of developing total combat vehicles systems, is that emphasis must be on the early interface of combat and training developments in the life cycle development process. The goal of developing a total combat vehicle system will be achieved if industry's efforts can tie together a fully documented training package, including complementary training devices, and a comprehensive logistics and support package when fielding combat vehicle systems. Only then will the total man/machine system be able to cope with a hostile training environment and meet *the* demands of the modern battlefield.

Combat developers must produce high quality, affordable, soldier-proof combat vehicle systems and equipment.

Only reliable and maintainable equipment will survive the rigors of the battlefield. The equipment we put on the battlefield must be of such quality that the soldier has faith that his fighting system will meet all his combat requirements. At the same time, it must be easy to maintain and not overly complex.

We can no longer afford to field training equipment which does not demonstrate some quantitiative measure of training effectiveness in excess of current training methods. This applies to combat vehicle and maintenance support training in the institution, as well as combat vehicle system training in the unit.

We need affordable alternatives to the way we train today, with no sacrifice in the quality of the end product.

These challenges to industry are not taken lightly. Indeed, there is nothing easy about these formidable challenges. There are often more questions than answers. Industry has an important role to play in the ultimate success or failure of the armor force. Unless the gap between materiel developers and the training developers is closed, technology of modern equipment cannot be optimized.

CAPTAIN JOHN J. SWEENEY was commissioned in the Transportation Corps as a Distinguished Military Graduate from Loyola College of Baltimore in 1969. A graduate of the Transportation Officer Advance Course and Rotary Wing Aviator Course, he also holds a Master's Degree in Management from the U.S. Naval Postgraduate School. He has served with the 187th Assault Helicopter Co. in Vietnam, 3-7 Cav, 703d Maintenance Bn, and 3d Aviation Bn (CBT). He is currently assigned to the Directorate of Training Development, Fort Knox, KY.

Determination In Battle

by Major General T. S. Hart

*This article is based on a presentation made by General Hart before a Royal Armoured Corps Conference in late 1978. Although a part of it is directed toward the British Regimental System, General Hart has many things to say regarding morale and conduct in battle that are pertinent to soldiers of all ranks, whatever their Army. **ARMOR** is pleased to pass along his remarks to its readers worldwide.* ED.

For a short time we are to put aside tactical doctrines, the requirement for a new main battle tank, restructuring, electronic warfare, and all the other familiar subjects which normally dominate Arms and Services Directors' Conferences.

As a change, I have been asked to talk about the soldier and his determination in battle. Because however good the equipment, however complete the staff work and planning, unless the soldier actually fights, defeat is inevitable. Events in Southeast Asia and the Middle East in the mid-seventies have certainly shown that the time-honored quotation, "*It is not the number of soldiers, but their will to win, which decides battles,*" is still very valid.

I first researched this presentation in 1974, but I have changed but little from my original script. This is not due to idleness but the realisation that with the possible reduction in the warning time of Warsaw Pact aggression we all may be required to react as quickly as the 3rd Airportable Division was expected to react in the old days.

Anyway, the principles involved in determination in battle are the same for troops based either in Tidworth or Fallingboestol, Hohne or Colchester.

Now all of us at various times in our careers have attended lectures on morale and leadership. In many cases the lecturer has been of the standing of Field Marshals Slim, Wavell, or Harding: commanders with quite unique experience of leading soldiers in major battles. It would be tactically unsound for a Director of Medical Services (DMS) to take on such company. I intend, therefore, to look at the problem in a slightly different and more academic way—and yet frequently refer to

history to bring my academic kite flying back to earth.

I will also quote from a variety of commanders throughout history who, although they knew nothing of the modern fields of behavioural psychology, knew instinctively what stimulated their soldiers to deeds of valour.

Fear and Courage

When discussing human behaviour, we are immediately on uncertain ground. There are many varying views, especially among experts. Therefore, when discussing courage, determination in battle, or morale—call it what you will—we have to accept some basic assumptions.

First, man is by nature an aggressive animal and unlike other animals, who merely seek to dominate, man is prepared to kill.

Next, although society is constantly changing, aggression is innate in man and has varied little, if at all, in recent centuries.

In our present culture, to display courage is still considered to be major, if not *the* major, virtue of the male—and deep down nearly all men, if honest, would wish to succeed as a warrior, if given the chance. Field Marshal Slim summed it up well when he said:

> "I do not believe that there is any man who would not rather be called brave than have any other virtue attributed to him."

What then is the problem? Here we have an animal that is aggressive. It will kill and, in the main, still holds courage in battle to be a virtue. Unfortunately in human behaviour nothing is quite so simple.

Considering the problem in purely physical terms, when faced with danger the body responds by certain physiological changes. The number of blood cells increases, the time blood takes to clot is reduced, more sugar is distributed to the muscles and many other changes take place so that physically he is ready to launch into the attack. There is, however, a snag: fighting may lead to a valuable victory, but it may also involve serious damage to the victor. The enemy invariably provokes fear as well as aggression. Aggression drives man on; fear holds him back. Those physical changes I have already described, increase in number of blood cells, etc, not only prepare the body to fight—but also for flight. In other words all that blood sugar can either be burned in combat or by taking off at high speed in the opposite direction. Physically, the body doesn't care which: it is *mentally* that the final decision is made whether to stand and fight or cut and run. Moran, in his classic book *The Anatomy of Courage,* defines courage as follows:

> "It is a moral quality, it is not a chance gift of nature like an aptitude for games. It is a cold choice between two alternatives, it is the fixed resolve not to quit, an act of renunciation which must be made not once but many times by the power of will. Courage is will power."

I would like to spend a little time examining those factors which either stimulate courage or erode it—for it must be accepted that all men have some degree of courage. Many things support or sap the will of the soldier and their importance in many cases varies as society changes. However, some factors are basic and remain constant.

Let us take the bad news first.

The major stress that can erode and destroy a man's courage and lead to mental breakdown is *fear.*

The emotion of fear is, of course, a perfectly natural, and defensive, reaction to any circumstances which threaten to endanger the safety of the individual. No man relishes the thought of wounding, or death.

In battle, fear varies in direct proportion to the real or imagined danger from the enemy. The great majority of soldiers overcome fear, as they have done throughout their lives, by an effort of will and by support from others. Certain situations, however, stimulate or magnify fear and therefore increase the chance of mental breakdown. The order of priority being a matter of personal choice. I would put the following factors on my list.

The Unexpected. Soldiers going into battle have received training and have been given certain information. They have, in the main, mentally adjusted to a certain course of events and most are prepared to meet what comes. If they are presented with a situation for which their training has been inadequate or which is completely unexpected, then the will that controls fear sags and crumbles. I am sure that this is the basis for the success of either tactical surprise in battle or the introduction of the unexpected onto the battlefield. Examples abound in history from Hannibal's elephants to the use of poison gas and the *blitzkrieg.* Clausewitz summed it up when he said:

> "It is of first importance that the soldier high or low should not have to encounter in war things which, seen for the first time, set him in terror or perplexity."

The Unknown. What man has not seen, he always expects will be greater than it really is. The modern soldier faces a battery of the most fearful weapons. Unless he is well trained and fully conversant with what is to be expected, then he will be anxious—and apprehension is fear in its infancy.

In the words of Thomas Hardy:

> "More life may trickle out of man through thoughts than through a gaping wound."

I would add that this fear of the unknown is most marked when the soldier is isolated, or at night.

Fear of Failure. Nearly all men have doubts as to how they will behave in battle. In some, this fear that they will fail and let down their comrades is a very real form of stress. And yet, perversely, in many the fear of failing and letting down the group can stimulate men to great deeds of heroism. There is an old German proverb, which is apt.

> "Some have been thought brave because they were afraid to run away."

It depends on the man's background and the degree of his attachment to this group.

The Noise and Sight of Battle. Battles can be, and with the Soviet present penchant for artillery we can certainly expect them to continue to be, very noisy affairs. The sheer battering of the soldier by noise can destroy his will. The sights to be seen on the battlefield can also be unnerving. Widespread destruction, in many cases, does not seem to affect the soldier as much as the loss of one of his immediate group.

Fear of Killing. Although we have at the onset accepted that man will kill; some, quite reasonably, because of their upbringing and teaching, are averse to taking a human life. This can in some cases cause a real and deep mental conflict. But in most, the excitement of battle, support from his comrades and, finally, kill or be killed, results in most men overcoming this fear.

Exhaustion—Mental and Physical. You are all aware of Moran's description of courage and his view that men have only a certain amount of courage in the bank. He goes on:

> "The call on the bank of courage may only be the daily drain or it might be a sudden draught which threatens to close the account."

There is no doubt that troops, however well-led, can only take the stress of battle for so long—then they break. Any commander, at any level, who tries to overdraw the account is courting disaster.

So far we have tended to separate the mental and the physical. This is, of course, an artificial division—the mental and the physical constantly interact. Therefore, physical fatigue, hunger, disease, thirst and, above all, the stress of adverse climatic conditions, can reduce the physical state of the soldier to such an extent that his will to fight is broken. Taking climate as an example, one only has to consider the effect of cold on most of Sir John Moore's troops in the Corrunna campaign—or even Napoleon's army in Russia. One writer described Napoleon's retreat:

> "The cold was the abominable thing: the dreadful enemy against which man could not fight and which destroyed them. The cold first struck on the night of November 5-6 and with that blow the dissolution of the grand army began."

And yet, exactly 130 years later, Van Paulus' Sixth Army fought at Stalingrad, poorly equipped for the climate, until early February. During the same winter Von Manstein's army fought one of the best cavalry and armoured delaying battles of all time in the Don and Donitz basins.

Really delving into the past—I doubt if there has been a more disease ridden army than the "British Army" that fought at Agincourt. Many could hardly stand and yet they totally defeated the heavy armoured box of their day. *Why?*

I think it is now time to leave those factors which sometimes cause armies and soldiers to give way to fear and despair. We will now look at what stimulates and maintains *courage* and enables the soldier to overcome adversity and his quite natural fear.

Again, there are a number of factors, some of which are constant and some which vary, as society varies. For example in Cromwell's New Model Army, a major force was religion. John Baynes in his excellent book, *Morale,* when examining the 2nd Scottish Rifles who fought so well at Neuve Chapelle, found that religion influenced only 50 percent of the officers and 10 percent of the soldiers. I am pretty certain it is a lower figure today, and yet psychologists will tell you that:

> "Those with deep religious convictions have a bulwark against loneliness, terror, fantasies conjured up by the unconscious and the unleashing of deep-seated conflicts."

Just what we need in the soldier in battle. But the same psychologists admit that such people form a minority in our conflict-ridden society. So, much as we might like to, we cannot count on religion to aid more than a few.

Let us consider patriotism. Moran describes his generation, as follows:

> "We went into the enterprise, the high adventure of 1914, with hearts singing."

Baynes, talking of a Scottish unit—and therefore more dour and down-to-earth folk—found that patriotism was certainly an influence on the behaviour of the 2nd Scottish Rifles; but that it was not comparable in importance with other factors. Certainly in our present society patriotism is not a dominant force. What do we have left? I think we have the same basic factors that we have always had—the strength of the well-integrated group and the individual soldier's identification with that group, leadership, discipline, and success.

The first choice—*the strength of the well integrated group*—may surprise you. But I believe it is the major force in the stimulation of courage and maintenance of good morale.

The Well Integrated Group and Group Identification

The fundamental patterns of behaviour laid down by hunting apes millions of years ago still shine through all the affairs of modern man. We did not evolve to live in huge conglomerations of tens of thousands of individuals. Our basic behaviour is designed to operate in the hunting group or as part of a tribe limited to hundreds—not thousands—of members. Loyalty to, and dependence on, the hunting group—and subsequently the tribe—are expressed in military society as *loyalty to the platoon,* the *company,* and, lastly, *the regiment.*

This form of loyalty and dependence goes way back to the very roots of man. Baynes, in his very deep analysis of the ingredients that made up the quite unquenchable courage of 2nd Scottish Rifles at Neuve Chapelle, puts *regimental loyalty*—in my view quite rightly—at the top of the list. I believe many in the Army have forgotten the cohesive power of this loyalty—but we will consider that later.

Leadership. Everyone has their own definition of *leadership.* While researching this presentation, I studied dozens of definitions—but the one that really comes alive for me is that by Correlli Barnet:

> "Leadership is a psychological force that has nothing to do with morals or good character or even intelligence: nothing to do with ideals or idealism. It is a matter of relative will powers, a basic connection between one animal and the rest of the herd. Leadership is a process by which a single aim and unified action are inparted to the herd. Not surprisingly it is most in evidence in times or circumstances of danger or challenge. Leadership is not imposed like authority. It is actually welcomed and wanted by the led."

That, in my view, is what *leadership* is all about. But how do you select such leaders? In the primitive hunting group leaders were accepted only after the most ruthless selection process. Is our selection adequate? This, we will consider later.

Discipline. The question of discipline has been the subject of considerable debate in a modern Army plagued by difficulties in recruiting from a society which has rejected many previously accepted forms of discipline. While agreeing with all that has been written about discipline from within and self-control, I still believe that discipline of the more traditional kind is extremely effective *in battle.* De Gaulle summed it up well:

> "Although soldiers carry within themselves a thousand and one seeds of diversity, men in their hearts can no more do without being controlled than they can live without food or drink. Discipline is thus the basic constituent of all armies, but its form must be shaped by the conditions and moral climate of our times."

Success. Obviously *success* is a factor of great importance: the modern soldier no longer accepts his lot stoically. He expects things to go well.

I include under this heading not only *success in battle*—but success from the point of view of things happening as planned. In other words *good administration.*

Although important, I would not rank success in battle alongside my first three factors because history has countless examples of well-led troops who pressed on through defeat after defeat.

An Example From History

The chances, in the next conflict, of a "phony war" period in which units can shake down are extremely unlikely.

I have therefore examined modern history to find a bat-

tle—preferably a *worst case*—which is comparable to one that the Army may be asked to fight. Having found such a battle, I examined what were the factors that, from the *morale* point of view, made the battle a success or failure.

The battle I picked was *the defence of Calais in May 1940 by the 30th Brigade.* The brigade, when committed to Calais, comprised Queen Victoria's Rifles (TA); 2nd Battalion, 60th Rifles; 1st Battalion, The Rifle Brigade; and 3rd Royal Tank Regiment.

Their mission was to defend Calais and thereby assist the withdrawal of the British Expeditionary Force (BEF).

The enemy units were the 1st Panzer Division, at the onset, followed by the 10th Panzer Division from Guderian's 19th Corps—supported by massed artillery and up to 100 *Stukas.*

Battalions were moved at literally a few hours notice from East Anglia and Southern England to Calais, and in a matter of hours went into action.

They left most of their transport and much of their ammunition in the United Kingdom. The staff work of their move was a shambles. As they arrived in Calais, base troops and wounded were being evacuated and dead were laid out on the quay. Thy had no artillery support even though the Royal Navy did their best with destroyers. The town was full of refugees and fifth columnists and the cellars held thousands of French and Belgian soldiers who had had enough.

The front they had to defend stretched for 6 miles. The weather was extremely hot and soon after battle was joined the water supply was virtually destroyed.

Both battalions had trained for mobile operations as part of the 1st Division, but then were committed with no retraining to street fighting.

The noise from massed artillery, tanks, and *Stukas* must have been unbearable.

To top it all, for 2 days the troops were led to expect that they would be evacuated by sea when the position became untenable. Then they were asked to defend to the last. (I did say I looked for a worst case).

This rather doleful tale contains every one of my adverse factors. The *unexpected;* the *unknown; fear; exhaustion; noise of battle;* and *unpleasant sights.* All were there in abundance.

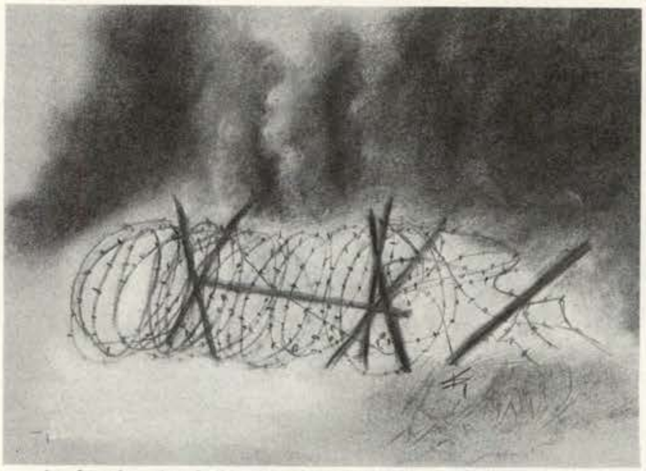
If you had commissioned a psychiatrist to put together a situation for the complete demoralisation of troops, I doubt if he could have improved on this situation.

But far from being demoralised, they stood and fought for 4 days. And accounts from the 10th Panzer war diaries show that at times they fought markedly superior German forces to a standstill.

On the very last morning, the 26th of May, 1st Battalion, The Rifle Brigade was down to 14 officers and 290 men. One company was reduced from 150 to 30 of all ranks. The 60th was probably worse off.

And yet Heinz Guderian questioned the Commander, 10th Panzer, as to whether or not he should stop the attack and ask for more air strikes—such was the resistance.

When analysing the accounts in *The Rifle Brigade 1935-1945,* by Hastings, and especially in Airey Neave's book



on the battle, the following of our positive factors come out time and time again:

Most of the personnel—officers and men—of the Regular battalions had been together for years. Even the Reservists that rejoined the battalions were 7-year men, who slipped back into the family with ease.

Pride in the regiment was enormous.

Leadership, from Brigadier Nicholson down, was of a very high order—one company commander, wounded on three separate occasions, refused to leave his company.

Thanks to Brigadier Jimmy Glover I found one more source, Major General Tom Acton, who was Adjutant to 1st Battalion, The Rifle Brigade, in Calais.

He confirmed the shambles and many of the facts in Neave's account—but he said two things which I consider to be of tremendous value.

Having listened to his account of how everything went wrong I asked him the direct question, "Why did they fight so well?"

After quite a pause he said,

> "The Regiment had always fought well, and we were with our friends."

Just simply that.

When asked what, apart from the obvious upset the men, he said,

> "The breakdown of the normal organisation and break up of previously cohesive groups *upset the men* and *had an adverse effect on morale.*"

I will end this account with two quotations from Airey Neave:

> "It may be fashionable today to sneer at regimental loyalty, but Calais could not have been held long without it."
>
> "So strong were regimental feelings that some wounded had to be taken out of POW columns by the Germans for treatment—even when they had been on the march for days."

What Can Commanders Do in Peace?

I think from the factors I have given you, and the account of Calais, you will have worked out what I am going to suggest. I have plugged time and time again the strength of the well-trained, well-knit group. At the beginning of this lecture I said, "The great majority of soldiers overcome fear, as they have done throughout their lives, by an effort of will and by support from others." This support is provided by the group and their leaders. But the group is only effective if it has been together for some time. The cohesive bonds having formed, and identification with the group and tribe having fully developed.

In the case of leaders, trust takes time to develop unless the leader has that instant magnetism that is found only in one in a million men.

May I quote from *Regulations for the Rifle Corps,* prepared in 1800, by Sir John Moore who is considered by many the greatest trainer of soldiers the British Army has ever had.

> "Having formed his company he (the captain) will then arrange comrades. Every corporal, private, and bugler will select a comrade of the rank differing from his own, i.e. front rank and rear rank, and is never to change him without the permission of his captain. Comrades are always to have the same berth in quarters and, that they may be as little separated as possible in either barracks or the field, will join the same file on parade, and go on the same duties with arms."

Commanders must therefore resist turbulence in their units. Every effort must be made to keep companies, platoons, and sections together for lengthy periods so that the bonds so necessary in war can be forged in peace. It is horrifying, when one examines recent operations, to see how the *ad hoc* unit has become normal practice. In war such an organisation is a potential mob. When we either hamper the buildup of company and regimental loyalty, or deliberately break it down, we throw away one of our few major assets.

I next turn to *leadership.*

Earlier, I mentioned how the hunting group threw up its leaders after ruthless selection within the group.

We have a different system. Some of our leaders, often raised in a society with different values, pick the next crop of young leaders.

Further selection takes place at Sandhurst and then in the regiment where the new young leader is imposed on his group. (Remember leadership is welcomed by the group, not imposed).

In the pre-1914 Army and, to a slightly less extent the pre-1939 Army, young officers spent years with the regiments and the weeding-out process was quite severe. The soldiers themselves, to some extent, played a part in selection. Officers spent many years in close contact with their men and the grapevine soon made clear the views of NCOs and men.

Nowadays young officers spend less time with their regiments and less time in close contact with their men.

Commanders must make every effort to halt and, if possible, reverse this trend.

While considering *selection,* you may ask why we cannot pick out those men who will break in battle and become psychiatric casualties. If possible, now is the time to discover them and weed them out—not as that armoured box motors past.

Lord Moran in his book, mainly written as a result of his experiences as a Regimental Medical Officer in World War I, strongly advocated such a procedure. In World War II attempts were made to initiate selection procedures. Despite these efforts, in the campaign in North West Europe alone, the British Army had over 13,000 psychiatric casualties.

The United States, in World II had overall 1½ million psychiatric casualties admitted to hospitals, with nearly ½ million being invalided.

Obviously the system was not a roaring success.

The modern view is that preservice selection is notoriously unreliable and it can be expected to eliminate only the more obviously unintelligent, unstable, or mentally disordered.

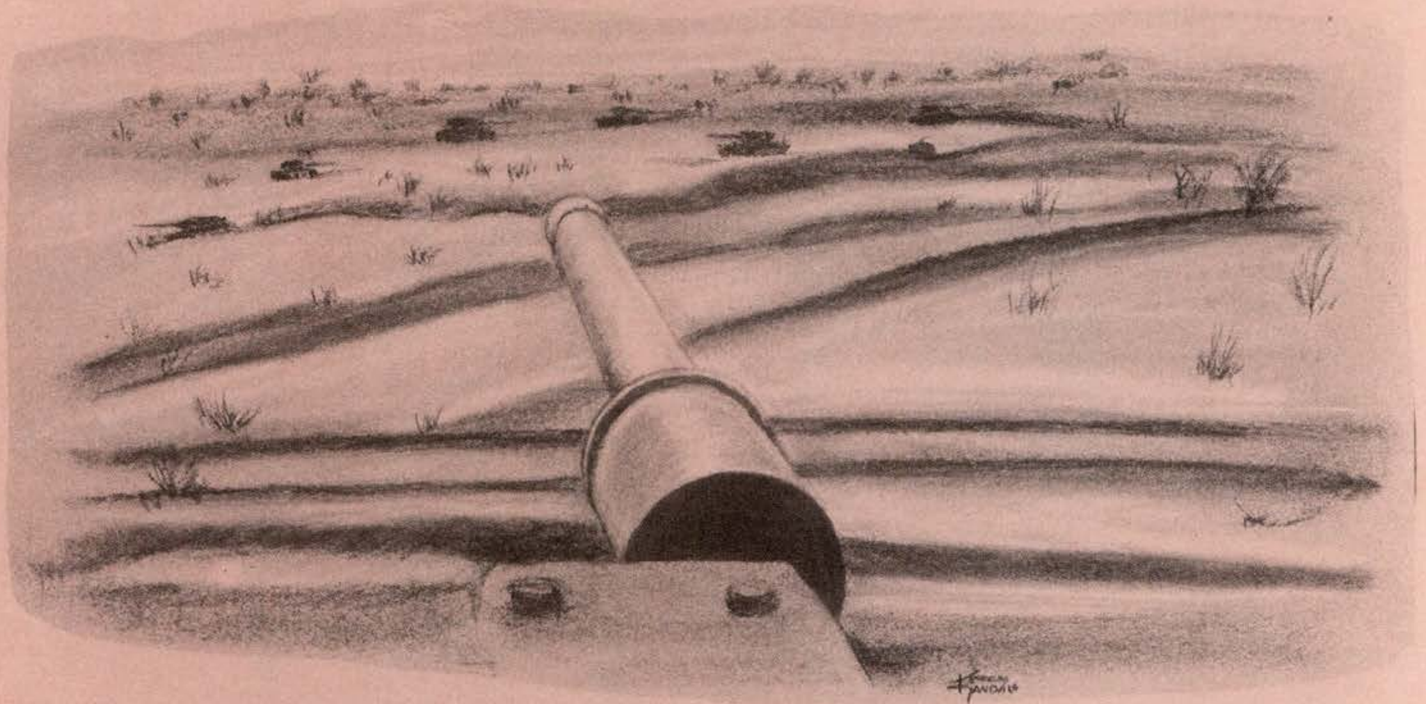
It is more practical to eliminate the vulnerable on the basis of their performance during service and men who do not have the necessary fibre to make soldiers must be gotten rid of by administrative means.

I realise that there are great pressures to keep up the numbers, but the retention of the grossly inadequate is akin to retaining a Trojan horse in a unit.

The importance of the *power of the group* and *leadership* have been stressed. But it would be unwise to depend on these two morale factors alone. In the battle we may have to fight, we must take into account every means of encouraging *determination in battle.*

Earlier we considered the adverse effect of *the unknown.* Our soldiers are being asked to act aggressively against a quite alarming enemy—namely a large concentration of Russian armour. Even Israeli troops on the Golan Heights—troops with battle experience, found the sight unnerving.

How many of our infantry soldiers have worked with tanks? How many are convinced that their weapons will destroy enemy armour? How many of our infantry soldiers are aware how vulnerable the tank is to attack at very close range by determined troops—especially in close country?



Obviously I do not know the answers. *All* I can say is that if *all* our troops have this experience and knowledge, there is one less factor to cause them fear and despair.

If only a few of our troops are so trained—we may have ourselves a problem.

Soldiers should be given every opportunity to gain experience of what we expect of them on the battlefield.

To keep a soldier away from what war is really like until he finds out for himself is as reasonable as keeping a medical student away from disease.

Physical Fitness

In virtually every account of battle, the exhausting effects of even short bursts of fighting is stressed. Only the really physically fit soldier will be able to combat such fatigue.

How long the overweight soldier, or the man who cannot meet standards of physical efficiency, will survive is a matter for conjecture. I am not convinced it will be for very long.

Remember the reply of the Delphian Oracle when asked what Sparta had most to fear? One word, *luxury.*

Success

I included *administration* in my initial consideration of *success.* Repeatedly in military history—it was certainly so at Calais—the well-administered unit is seen to overcome outside confusion and pressure.

Soldiers gain tremendous encouragement from the knowledge that, whereas the whole thing might appear to be a shambles, their unit moved well and was fed, etc. Obviously such *administrative skill* is built up in peacetime.

What Can Commanders Do in War?

Obviously the factors I have already mentioned in peace are equally applicable in war. There are, however, two subjects I would like to discuss; *information* and *psychiatric casualties.*

Information. We have already discussed how one aspect of the power of *the unknown* undermines the soldier's will. There is one other; namely *lack of information.* Lack of knowledge as to what is happening both to our own troops and the enemy can lead to rumour and uncertainty.

We will be putting troops into a foreign country in the midst

of chaos. There will be refugees on the roads and possibly retreating troops from other formations. Rumour can hardly fail to spread like a plague in such a situation. The only antidote is *accurate-information.* While security places certain limitations on the amount of information that can be given, whenever possible the soldier *must* be kept in the picture.

Psychiatric Casualties

Despite all our efforts, when stress becomes too much, or the soldier has been under stress for too long, the will breaks and the soldier suffers psychiatric breakdown. This breakdown can present in many forms:

Panic states which result in headlong flight.

Acute depression where the patient sits mute and motionless.

Acute anxiety with extreme restlessness and agitation.

Exhaustion states where troops show abnormal fatigue.

Hysterical reactions, including hysterical blindess, paralysis, etc.

A word of caution. It is to be expected that in battle everybody will be keyed up. Men can well sweat, have tremors, and be short tempered without being on their way to a psychiatrist. However, commanders at all levels must watch for the first signs of *defeat* in a soldier and come to the man's rescue. Leaders, officers or NCOs, who have been with their men for some time and know them well will quickly recognise the first signs. It is at this stage that a joke, asking the man to carry out a simple act, the odd word, or even a hand on the shoulder, will give him the support he needs.

How many times have we read in descriptions of a battle that, just before the action started, in that terrible short period of inactivity when the will begins to ebb away, "*The leader moved amongst his men.*" This sort of situation is the test of *real leadership.* If a man is causing concern to a leader, asking that man to accompany him as he moves about often gives the soldier the support he needs.

There is no doubt that *inactivity at a time of tension breeds fear* and that the best antidote to the poison of fear is *purposeful actions.*

Once action begins, obviously the most steadying act by the soldier is to fire his weapon. This may seem a blinding glimpse of the obvious, but Brigadier General (then Colonel) S.L.A. Marshall, United States Army, carried out a survey involving several hundreds of U.S. Army infantry companies in World War II. He found that only some 15 to 20 percent of rifle company personnel actually fired upon the enemy or exhibited appropriate aggressive activity during battle. This negative attitude by some members of the group will present the leader with his greatest challenge. He must realise it may happen and be prepared for it.

So far, the whole of this has been geared to the prevention of psychiatric battle casualties. What do we do when, despite all efforts, some of our men really start to break?

Men in early stages of psychiatric breakdown are highly suggestible and can still be retrieved, especially by a positive approach by a leader the man trusts and respects. I would suggest that there are three possible courses of action.

If it is still possible to communicate with the man, attempts should still be made to stir him into action by carrying messages, helping a comrade, etc. This activity could be carried out at a company aid post or company headquarter level.

If the man is incapable of such action, rest, sleep, food, etc. actually in the company aid post can often work wonders.

Lastly, there is the psychiatric casualty who, either by his position in the company hierarchy, by his symptoms is causing unrest amongst the others, or by the very seriousness of his symptoms cannot be treated within the company and therefore has to be evacuated.

Even in the case of the last group I would suggest nearly all could, and should, be treated at the regimental level.

There is one final point I would like to make. A psychiatric casualty, in many cases, knows he has failed. Censure and mockery from a respected member of the group will do him more harm than good. He wants *firm* but *understanding* support. He needs *firm direction* and *aid* from a member of his group or a leader he respects. He *does not* need a shoulder to cry on or, in most cases, certainly not a psychiatrist.

Conclusion

As a parting shot I would like to make one last quotation to leave in your minds the vital part the well integrated group plays in defending the soldier against psychiatric breakdown in battle:

> "We trained hard, but it seemed that every time we were beginning to form up into teams we would be reorganised. I was to learn later in life that we tend to meet any new situation by reorganising. And a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency, and demoralisation."

Petronious Arbiter, 210 BC

It seems that man doesn't change much—neither do the mistakes he makes. If you are to remember anything from this lecture, remember General Action's remark, *"The Regiment had always fought well. We were amongst our friends."*

MAJOR GENERAL T. S. HART, MB, MFCM, DPH, DTM&H, Director of Medical Services United Kingdom Land Forces, was educated at Dulwich College and trained in medicine at Guy's Hosptial. Commissioned into the Royal Army Medical Corps (RAMC) in 1951, he was appointed Regimental Medical Officer, 1st Battalion, Royal Norfolk Regiment and served with the unit in Korea and Hong Kong. In 1953, he joined the British Army of the Rhine (BAOR) where he served as Second-in-Command of the 14th Field Ambulance Company and later as Deputy Assistant Director of Medical Service, 2d Infantry Division. After attending Staff College Camberley in 1958, he held an appointment in the Ministry of Defence (Army) until 1961 when he attended the Senior Officers' Course of the Royal Army Medical College, being awarded the Montifiore Prize and Medal in Military Surgery. Following the Senior Officers' Course, he attended the London School of Tropical Medicine. Between 1963 and 1969 he commanded the British Military Hospital Kluang, Malaya; attended the Joint Services Staff College Latimer; served as Assistant Director of Medical Service (ADMS), Eastern Command; and commanded the Military Hospital Colchester. Following a tour in the Manning Branch of the RAMC, he attended the Royal College of Defence Studies and subsequently became ADMS, 3d Division. In 1975, he was promoted to Brigadier and served 2 years as Deputy Director of Medical Service Corps, BAOR. He joined Headquarters, United Kingdom Land Forces as a Major General in 1978 and became Director of Medical Services.

Train Alone

by Second Lieutenant David F. Rich

Platoon leaders, have you ever said to yourself, "Why can't *I* have more input into *my* platoon's training?" "Why can't *we* train by ourselves, on what *we* need to work on?", Why do *we* always have to be part of a larger group training exercise?", or "When will *I* get some experience coordinating rations, fuel, ammo, etc.?" If you've ever caught yourself asking any of these questions, then the 1st Battalion, 66th Armor, 2nd Armored Division might have the answer for you—it's called *Train Alone.*

The National Training Center tests conducted early in 1979 at Fort Hood indicated that once battle begins, a platoon becomes an almost independent fighting unit. These results, therefore, necessitated an increased emphasis on small-unit-type training for armored units. From this necessity, the *Train Alone* concept was launched, which allowed platoons to train, by themselves, in a tactical environment on those aspects of training tailored to each platoon's needs and level of proficiency. This concept demonstrated a positive attitude among higher level commanders toward renewed emphasis on training at the platoon level and seemd to be a radical departure from the past when "bigger means better" operations seemed to represent the norm.

Platoon-level *Train Alone* periods provide a unique opportunity for today's tank platoons to develop the tactical proficiency and technical expertise required in small unit operations in combat. Defined simply, *Train Alone* is a chance for the platoon leader/platoon sergeant to conduct the training they perceive as necessary, in a tactical environment, without interference from higher levels of command.

Like all military operations, regardless of the size, early and effective planning represent the keys to success and mission accomplishment. *Train Alone* is no exception for the platoon leader. Not only does *Train Alone* provide a junior lieutenant valuable coordination experience with the battalion staff personnel, but perhaps for the first time in his career *everything* within the confines of the mission depends solely on his efforts for success. All logistics, such as fuel, parts, rations, ammunition, ranges, and recovery resources have to be arranged by the platoon prior to leaving the motor pool. Outside resources for additional support or training are also generally available, but again, timely planning is the measure that ensures success.

Writing a workable timetable and training schedule for the period involved, usually 3 days, is another major task for the platoon leader and must be accomplished well in advance of the *Train Alone* date. In our case, tank commanders were included in early meetings held weeks before the operation to determine what problems were present in the individual tank crews and to rank-order these problems to facilitate better the planning necessary to eliminate them. Once trouble areas were discussed and priorities assigned, additional coordination could be made with organic or outside elements that could assist in correcting deficiencies. The input from the tank commanders directly involves them in the preparation and planning stages and provides the platoon leader with another perspective of his platoon's state of readiness in selected areas.

Another unique aspect of the *Train Alone* program is the economy in training area and material necessary to train effectively only those platoons requiring training, as opposed to sending an entire company or battalion to the field. In today's cost-conscious Army, training opportunities must be maximiz-

ed to ensure that the training presented and the lessons learned justify the expenditures made.

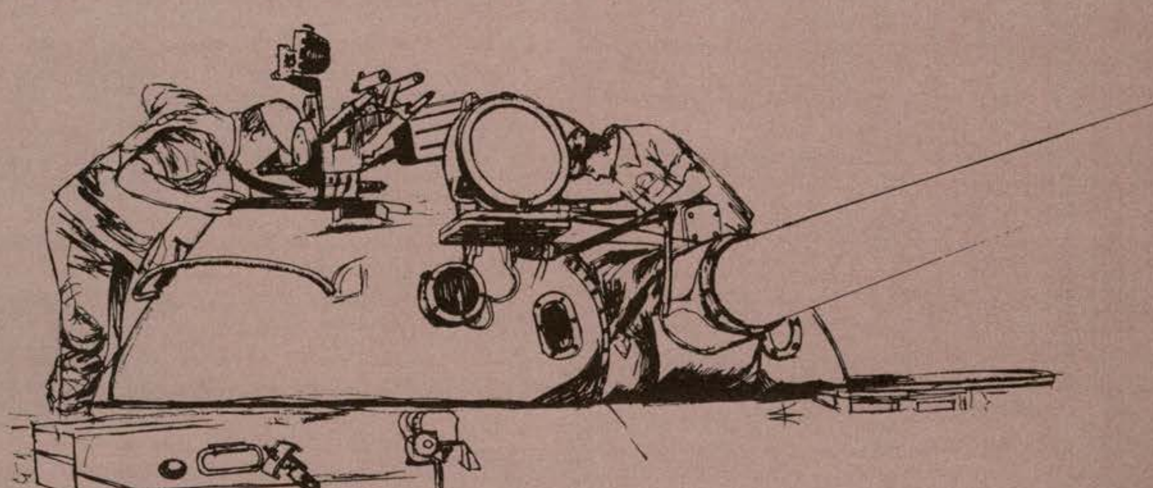
One thought that every platoon leader needs to keep in mind while planning for a *Train Alone* session is the attitude of the average tanker within the platoon. This armor crewman is probably 18 to 20 years old, has a high school level education, has served a year or more in an armored unit, and is no stranger to a 3-day field problem. He probably will view the first *Train Alone* period as he does most other field exercises—as a 3-day block of boredom broken only by some simulated engagements, chow halts, and sleep. The task of changing this common attitude rests squarely with the platoon leader and his planning efforts. Coordination of new and different training for the platoon is one way to spark interest among the troops. Such training may be in the form of "hands-on" classes, which lend themselves more appropriately to small groups and help keep interest levels higher than lecture-oriented training.

Relief from the "Motor Pool Syndrome" is another valuable benefit to be gained from periods of *Train Alone*. Repetition of work within a platoon, which is motorpool-bound weeks at a time, becomes boring to the average soldier who performs the same tasks over and over again on his vehicle without ever rolling it through the gates. Also, the brief 3-day period represents a time when training can be accomplished with 100 percent participation and without interference from such things as appointments, detail manning requirements, guard, and special duty.

After a period of planning and coordination, the platoon leaders involved should be required to brief their company commander and the battalion commander and his staff. The purposes of the briefings are to review the training schedule prepared by each platoon leader to ensure its feasibility and to aid in any last-minute coordination efforts.

Finally, with all prior coordination requirements out of the way, the first morning of *Train Alone* arrives. Nothing demands that it be the type of day when the platoon thunders out of the motorpool at the crack of dawn, but departure should be made at an hour that still allows sufficient training time after movement to the operations area has been accomplished. In our case, movement to the training area was done aboard heavy equipment transports (HET) to minimize costs of roadmarching a platoon of tanks 15 miles to a training area and to save on the normal wear and tear of such a roadmarch on the vehicles. As often happens, the HETs were late in arriving at the designated pickup point. Late arrivals are no problem with such a small group because individual SQT-oriented training can be set up within minutes among the assembled vehicles using "hip pocket" lesson plan packets that each tank commander carries. Tank commanders supervised the stations for each task that was taught and tested. A company or battalion-sized group would have been almost impossible to control and keep occupied in such a fashion if the same thing had occurred. Late arrival of the HETs also demonstrated flexibility and responsiveness of a platoon-level schedule when hit with delays.

After unloading in the assigned training area, our first task was to move to and occupy a defensive position. Tank commanders then supervised, demonstrated, and explained the camouflaging of their tanks to ensure that each tank crewman understood the need for and techniques of proper camouflage. Once camouflage had been applied satisfactorily, everyone was dismounted and moved to a nearby wooded area for an organized class. An area had been prepared on the ground as a minature terrain board. Through the use of Friendly and Threat scale models, the instructor (one of the tank commanders) demonstrated different movement techniques for newly assigned members of the platoon. Use of the terrain board and models made it simple for everyone to see and discuss proper formations, times for their use, hand/arm signals for each, reaction to enemy engagement, and helped conserve valuable fuel. Proper relationship between tank sections was discussed for each movement technique. Additionally, each member of the platoon was given a scenario within which to act as the platoon leader and maneuver the platoon of friendly tanks against the enemy. Direct involvement of each member of the platoon enhanced the class and turned a potentially boring instructional period into an enjoyable experience for everyone involved. Total participation was also a very effective method to ensure attention to the instruction being given and to build the camaraderie within the platoon. Being away from the confinement of the typical classroom setting, also aided in enjoyment and learning for the troops. During the class, such things as proper use of terrain for cover and concealment, effective use of natural firing positions, and the importance of proper engagement sequence when confronted by a multiple target array were stressed to the new troops. At the conclusion of the class, when it was time to put into practice what had been learned, everyone seemed to have a better understanding of what to do in a given situation. So, instead of wasting a lot of time, effort, and fuel to teach things while on the move via radio, the same instruction had been effectively given using a makeshift terrain board, some inexpensive plastic models, and total participation.



Chow provided another lesson in putting into practice prior planning efforts. Since three platoons from the 1-66 were involved in adjoining training sectors, it was necessary to select a messing site equally convenient to all platoons. Sequence of the type of meals each day was A-C-A. This provided the best training-oriented messing schedule possible because the C-ration noon meal could be eaten at each platoon's convenience in their respective training area.

After an afternoon filled with maneuvering and navigation practice, night was again time for instruction on a variety of subjects. When the tanks were pulled into a defensive lager position, the platoon was allowed to "go admin" for the instructional period. A fire was built to keep away the chill and provide light for the classes. Subjects were again taught by the tank commanders and included such subjects as NBC warfare, communications, and the handling of prisoners of war (POWs). Handling of POWs was especially stressed because of some inherent difficulties in handling prisoners of war experienced by armor personnel as compared to infantry or other ground troops. Stand-to procedures and the importance of stand-to was discussed along with a sequence of events that should be included by each crew during stand-to every day. Finally, the next day's schedule was highlighted to give everyone some idea of what was to be worked on. After answering all questions, a radio watch was established along with security within the platoon area and it was time to grab a few hours of sleep before starting again on another day of training.

The second day of our *Train Alone* began with a stand-to and immediate movement from our overnight lager to the messing area. Use of the stand-to move demonstrated the need for readiness by each crew during stand-to. Movement techniques discussed the previous day were emphasized during the march and driving was done while buttoned up using the passive viewing devices of the *M-60A1* RISE tank.

Day 2 was devoted largely to more hands-on classes. An engineer squad arrived at a pre-arranged site to demonstrate proper placement, handling, and recovery of mines. Instruction also included mine identifications, fuzing and defuzing, and recording of minefield data. The platoon members were required to install and recover their own hasty minefield on a likely avenue of approach to the platoon position.

Later in the morning, another practical demonstration and instruction was given by the medical platoon leader. Keeping the instruction geared to the average armor crewman and what wounds he could expect to see on any future battlefield kept interest high throughout the class. Use of materials on hand was stressed as a means of first-aid until qualified medical help arrives. Tank evacuation of wounded crewmen was also covered and a major lack of knowledge and practical experience in this critical area was eliminated.

After a short halt for C-rations, members of the Opposing Force (OPFOR) cadre arrived with selected Threat equipment items to demonstrate and answer questions. This block of training was, without a doubt, the highlight of the operation because it provided an opportunity for everyone in the platoon to see actually and operate Threat equipment and to determine for themselves the strengths and weaknesses of each article and to minimize some of the inflated ideas our soldiers have about the Threat's unchallengeable supremacy. Operating characteristics were compared to our equipment by driving the Threat vehicles throughout the training area over different types of terrain.

Night again was devoted to training; this time with passive sights and drivers' viewing devices. Target identification and tracking was practiced using one tank from the platoon as the Aggressor attempting to creep up on the defensive position without being detected. Drivers became familiar with their passive viewers during a night road march and cross-country operation. The passive viewers and sighting systems provided a distinct advantage over the *M-60A1s* not equipped with them and their capabilities were enthusiastically praised by everyone using them for the first time.

After lagering for the night in defensive positions, the platoon again "went admin." A fire was built and a platoon rap session was held. Several advantages can be noted from an activity of this sort. Problems encountered, as well as highlights of the day's training, were discussed. Not only did the session provide a chance for each man to air grievances, but the feeling of camaraderie during shared experiences was there and helped to pull everyone into a more cohesive unit. The advantages to be gained from a periodic activity of this sort cannot be overstressed. Such rap sessions, made easy in the field, are definitely a positive addition to a platoon's morale and attitude.

The third, and final, day was largely structured to facilitate movement to garrison and included another HET movement from a prearranged site, washing of vehicles, after-operations maintenance, and cleaning of weapons.

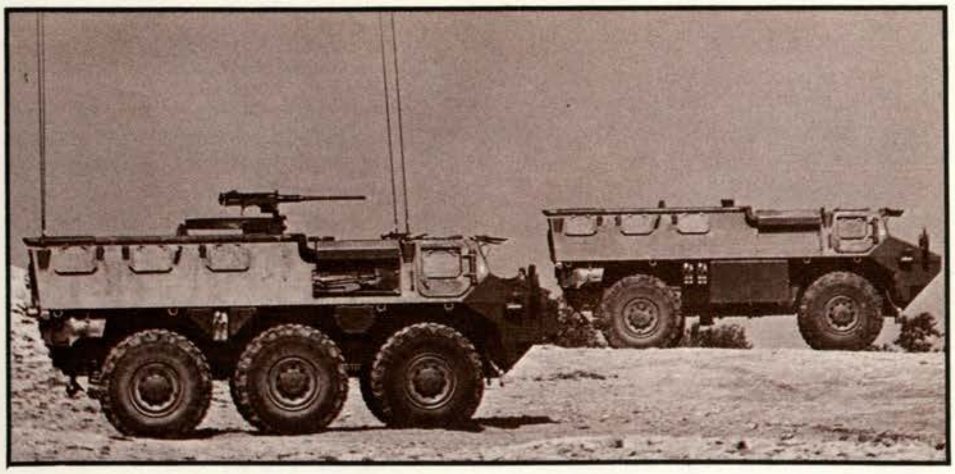
While the preceding narrative of one platoon's *Train Alone* program is highlighted, it is not intended to serve as a rigid formula for success to be applied to every platoon, on every post, throughout the Army. The possible range of activities is limited only by the imagination and initiative shown by the platoon leader/platoon sergeant during the planning phase of the operation. Aggressors, interservice cooperation, reconnaissance flyovers, and air movement represent just a few additional possibilities that might be scheduled with enough advance time in planning. Each *Train Alone* seems to provide a foundation on which to move to bigger and more demanding training during the next operation.

Now, platoon readers, there's one unit's answer to a recognized need to have more small-unit training. And when all the reports, after-operations data, and other official paperwork have been filed or cleared away, the best recommendation comes from the troops when they say,—"Sir, this works!"

SECOND LIEUTENANT DAVID R. RICH was commissioned in Armor from the U.S. Military Academy in 1978. He had 2 years prior service before attending the U.S. Military Academy Preparatory School. After 15 months as a tank platoon leader in 1-66 Armor, he became the Transportation Section leader of that battalion.

French Fighting Vehicles

by Colonel
P.A. Loubens
and Lieutenant Colonel (Ret)
R.R. Taylor, Jr.

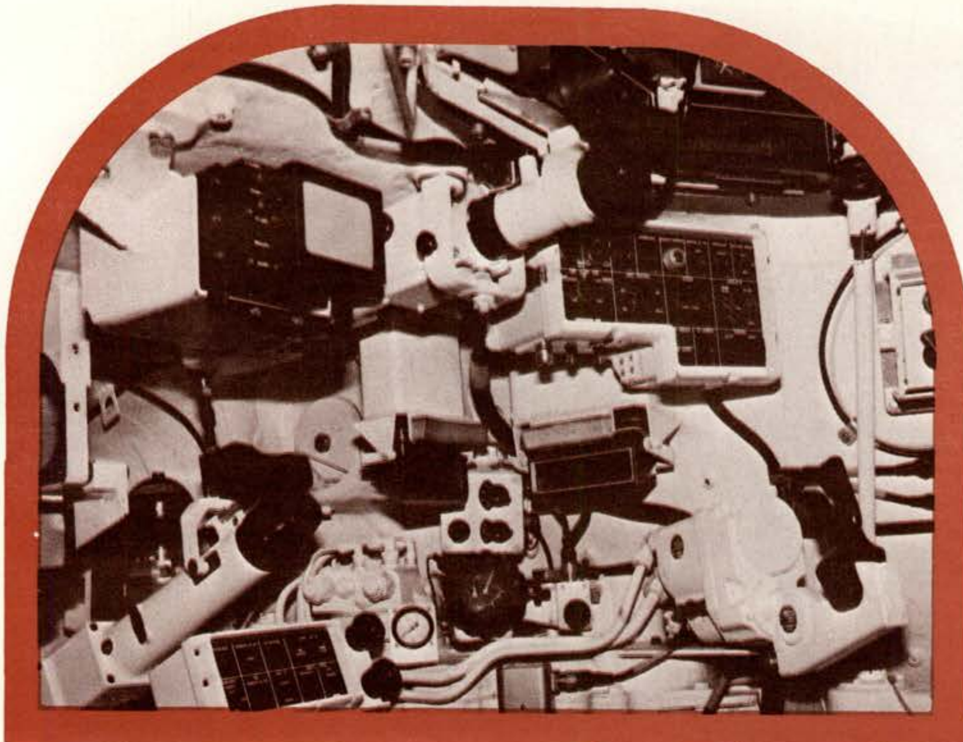


The modernization of the French Army's armored force has resulted in improvements to three of its primary fighting vehicles and the production of a new tank for sale to foreign armies.

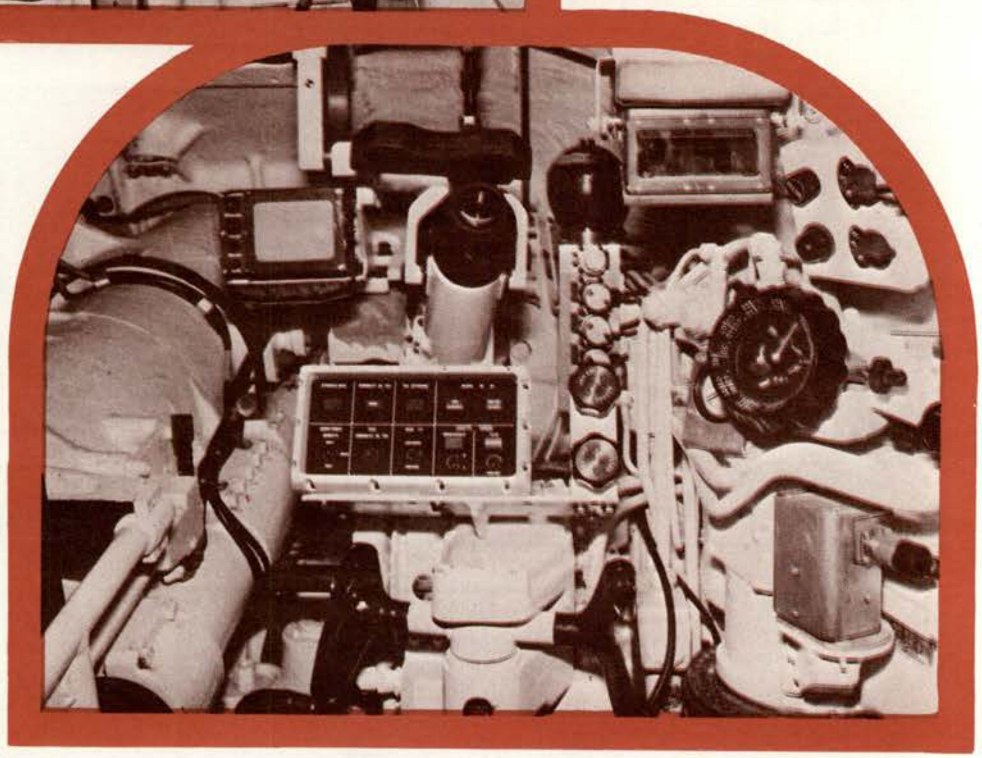
Of these vehicles, the *AMX-30 B2* is to the French *AMX-30* what the *M-60A3* is to the American *M-60A1* in that it is a greatly improved version of a good tank that has been in production for more than a decade.

Automotively, the basic model of the *AMX-30* tank which was first produced in 1967 has been improved in the *B2* configuration by installing a new transmission that improves engine efficiency, thereby increasing the vehicle's mobility, agility, and driving qualities.

The *B2's* firepower has also been



Commander's Station, AMX-30 B2



Gunner's Station, AMX-30 B2

enhanced by the installation of the (COTAC) *Conduite de Ti Automatique* or automatic fire control system which incorporates the use of a laser range finder, light intensification equipment, an electronic computer that calculates and displays fire correction data, and the capability to measure target speed.

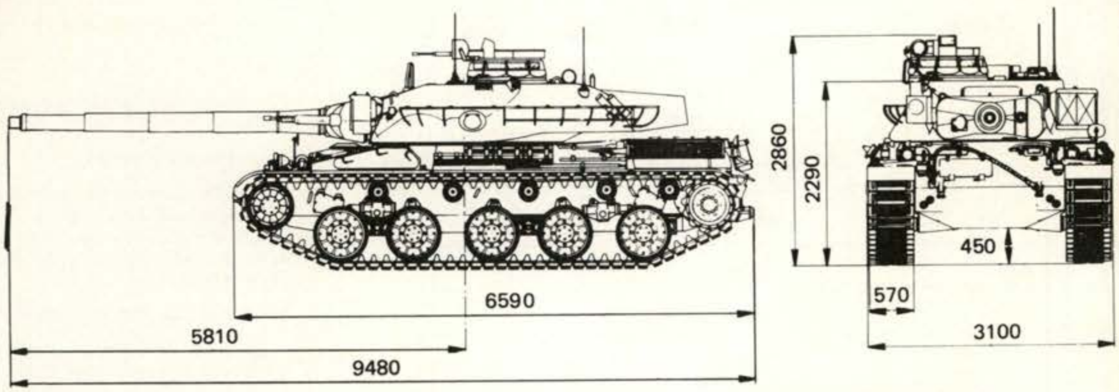
To use the fire controls, the gunner simply lays on the target and presses a single button that simultaneously initiates target speed measurement, rangefinding, and fire correction data calculation and input. As soon as the sight is automatically or manually reset, the gunner fires. The accuracy of the fire correction data calculation and display is about .1 of a mil. Target servicing, from acquisition to firing, takes only 10 seconds or less.

A low-light-level TV camera is also an integral part of the COTAC system. It is used as an observation device at night and during periods of poor visibility and can be used to lay the main gun. Monitors for the camera are located at the gunner's and tank commander's stations.

An additional feature of the improved fire control system provides stabilization of all armament, fire control instruments, TV camera, and searchlights in the vertical axis and the turret in deflection. This upgraded fire control array gives the gunner the capability for rapid engagements with a high hit probability, day or night, against stationary or moving targets.

Detailed technical data for the *AMX-30 B2* which is now entering the French inventory of fighting vehicles, is listed in table 1.

Table 1.



AMX-30 B2 Characteristics

Crew

4 (commander, gunner, loader, driver).

Weight

35 tons (travelling).
37 tons (combat loaded).

Armament/Turret

105-mm main gun; elevation, -8 to +20 degrees; traverse, 360 degrees.

20-mm automatic gun with super-elevation device for antiaircraft defense (can be fired by either the gunner or tank commander while buttoned up, but only by the TC against aerial targets).

7.62-mm machinegun mounted on cupola that can be fired remotely from inside the turret.

Turret is hydraulically operated.

Ammunition

HEAT and APDSFS: 47 rounds (19 in turret) (capable of firing all U.S. 105-mm rounds and some U.K. rounds).

20-mm: 480 rounds.

7.62-mm: 2050 rounds.

Optics and Fire Control

Commander's cupola has 10 direct-vision periscopes and a 10-power binocular telescope.

Cupola has a counterrotation capability.

Gunner uses a laser rangefinder with the COTAC fire control unit.

Passive light intensification equipment is provided for driving, observation and firing.

Gunner and commander also have low-light-level TV camera monitors at their stations.

Mobility:

Multifuel water-cooled Hispano-Suiza engine provides 700 hp at 2,400 rpm.

Power-to-weight ratio: 20 hp per ton.

Transmission:

5-speed gearbox (4 speeds forward and "powershift" reverse gear); torque converter with automatic bridging; hydrostatic steering.

Speed: maximum road, 65 kmph (39 mph).
average road, 50 kmph (30 mph).
cross country, 45 kmph (27 mph).

Ground pressure: 0.85 kg/cm^2 (12.1 psi).

Combat endurance (NATO standards): 18 hr.

Maximum gradient: 60 percent.

Trench crossing: 2.9 m (9.57 ft).

Vertical obstacle: .9 m (2.97 ft).

Fording: 2 m (6.6 ft) without snorkel.
4.4 m (14.5 ft) with snorkel.

Another tank that is emerging from the French fighting vehicle modernization program, the *AMX-32,* will be built exclusively for export. The *AMX-32's* engine, power train, suspension, armament, and fire controls are identical to those of the *AMX-30,* but it differs from the *AMX-30* in that it has additional "strap-on" armor on the front of the hull and turret and is equipped with protective armor side skirts.

The *AMX-30 B2* will continue to be the backbone of the French Armored Force through the 1980's, after which it will be replaced by the *Engin Principal de Combat* (EPC) or main combat vehicle. The EPC is now under development jointly with the Federal Republic of Germany and is scheduled for production sometime around 1990.

Historically, the French Army has had a high regard for wheeled armored vehicles and it continues to employ them for reconnaissance and cavalry missions, as personnel carriers for motorized infantry, and as the chassis for such weapons systems as the *Mephisto* antitank guided missile.

Two of the primary wheeled fighting vehicles of the French Armored Force are the *AMX-10 RC* (R for reconnaissance — C for cannon) and the *Vehicle de L'Avant Blinde* (VAB) or forward combat vehicle, which came into the inventory in 1979.

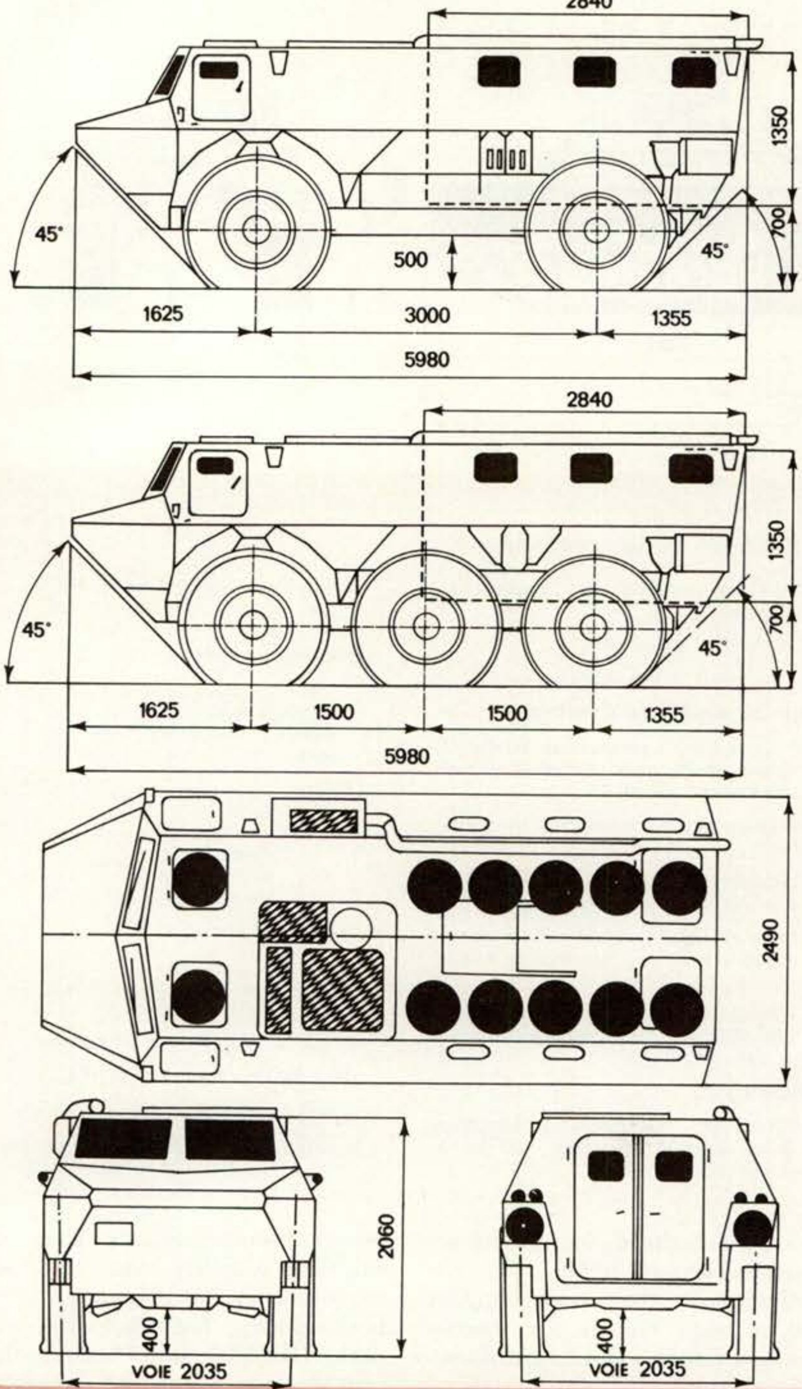
The *AMX-10 RC* is an amphibious reconnaissance vehicle that has excellent mobility over roads and cross-country. Its 105-mm gun fires high-velocity, high-explosive antitank (HEAT) ammunition, that provides a good antitank capability out to 2,000 meters. The fire control system for the main armament includes a laser range finder, automatic computation of firing corrections, and passive night sights.

Protection against nuclear, biological, and chemical contamination is afforded the vehicle's four-man crew by a pressurized combat compartment.

The *AMX-10 RC* will see service in corps cavalry squadrons and cavalry units at division level.

More detailed data for the *AMX-10*

Table 3.



VAB Characteristics (Configured as Armored Personnel Carrier)

Crew:

12 (driver, gunner, 9-man squad and its leader).

Armament/Turret:

1-man *Toucan* turret: manually controlled; elevation, -13 to +50 degrees at 16 degrees per second; traverse, 360 degrees at 12 degrees per second.

GIAT F-2 20-mm cannon:

Rate of fire: single shot, limited burst, or continuous.

Maximum rate of fire: 700-750 per min.

Electrical firing.

Electrical or manual charging.

Double feed provides selection between HE and AP.

Ready rounds: 126.

Mobility:

6-cylinder diesel engine provides 235 hp at 2,200 rpm.

Hydro-kinetic torque converter provides 5 speeds forward and 1 in reverse through a silent chain-drive transmission to a double reduction differential with spiral-conical gearing.

The suspension consists of independent wheels with torsion bars, telescopic shock absorbers, and progressive impact stops.

Steering is hydraulic.

Dimensions:

Length: 5.98 m (19.73 ft).
Width: 2.49 m (8.22 ft).
Height: 2.06 m (6.8 ft).

Agility:

Maximum road speed: 92 kmph (55 mph).

Minimum speed: less than 3 kmph (1.8 mph).

Water speed: 7.2 kmph (4.32 mph).

Range on roads: more than 1,000 km (600 miles).

Maximum gradient: 60 percent.

RC is listed in table 2.

Originally designed as an armored personnel carrier for motorized infantry, the VAB is also being used for command and control, as well as a communications, antiaircraft, and antitank vehicle, and as a cargo carrier.

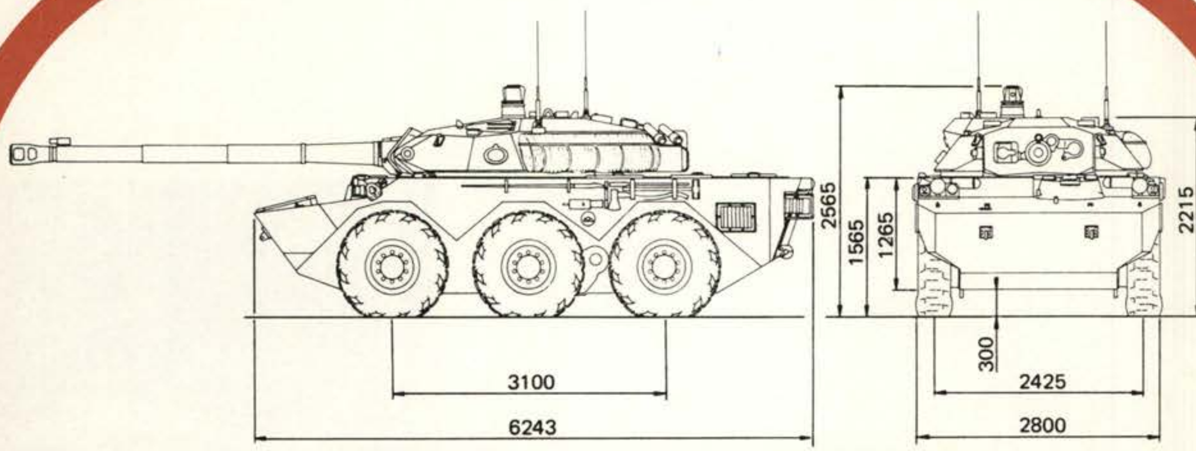
The four- or six-wheeled VAB is powered by a 235 hp, 6-cylinder diesel engine that gives the vehicle good cross-country mobility and top road speeds in the 80-90 kmph (45-50 mph) range.

When configured as an infantry combat vehicle, the VAB will accommodate 12 men, including a 10-man combat team.

Details of the VAB's performance, armament, and construction are listed in table 3.

In its role as an antitank system, the VAB is equipped with a *Mephisto* retractable launcher for firing the HOT missile out to ranges of up to 4,000 meters. When the launcher is retracted the vehicle is practically indistinguishable from the standard VAB and thus presents no special target signature to the enemy. The "disappearing" launcher also permits reloading without exposing the crew to enemy fire or NBC contamination. The missiles are also protected while the vehicle is in motion.

Table 2.



AMX-10 RC Characteristics

Crew:

4 (commander, gunner, loader/radio operator, driver).

Weight:

15 metric (16.5) tons combat loaded.

Armament/Turret:

105-mm main gun; elevation -8 to +20 degrees; traverse, 360 degrees.

7.62-mm coaxial machinegun.

4 smoke grenade launchers.

Turret is hydraulically operated by commander or gunner and also equipped with manual backup controls.

Optics and Fire Control:

Dual magnification telescope, laser rangefinder, and automatic introduction of firing corrections.

Periscopes provide all around vision from the turret.

Passive, light-intensification night sight and driving periscope.

Dimensions:

Length: 6.243 m (20.6 ft) (hull).
Width: 2.84 (9.43 ft).
Height: 2.565 m (8.46 ft).

Mobility:

Hispano-Suiza HS 115-2 water-cooled, V-8 engine provides 276 hp at 3,000 rpm.

Skid steering of nonsteering wheels.

Hydro-pneumatic suspension permits variable ground clearance and attitude.

Agility:

Speed: Maximum road speed, 75-80 kmph (45-48 mph).
Road cruising speed, 60 kmph (36 mph).
Cross-country cruising, 40 kmph (24 mph).

Range: 800 km (480 miles) on road or 18 hr endurance (NATO standards).

Maximum slope: 60 percent.

Water operation: fully amphibious, water jet propulsion, turns in own length, reverses, water speed is 7.2 kmph (4.32 mph).

Armament for the antitank version of the VAB consists of the 4-missile launcher and a 7.5-mm machinegun. The missile launcher has a ±10 degree elevation and a 360 degree traverse. The launcher's electrical controls give a manipulation speed of 5 degrees per second for elevation or depression and 30 degrees per second in deflection. A total of 16 missiles are carried for the system.

The welded armor, steel plate hull of the VAB provides a personnel compartment that is free of obstructions and permits rapid entrance and exit of passengers through a post-free double door. There are separate doors for the driver and commander and five roof hatches for emergency exit. Side and rear portholes of bulletproof glass with protective shutters give all-around visibility. The vehicle is also equipped with passive light-intensification devices for night firing and driving. The VAB is also amphibious and air transportable and provides protection against NBC agents.

Although it is less costly and easier to maintain than its *AMX-10* tracked counterpart, the VAB is not intended as a replacement for it. The VAB will be used only as a personnel carrier in the motorized battalions of the infantry division and for special roles in the armored division's headquarters and in the headquarters elements of armored battalions. The *AMX-10 P* will continue to be the personnel carrier for mechanized divisions and the mechanized elements of the armored divisions.

All-in-all, the French Army's research and development, testing, and production programs have provided fighting vehicles that are well-suited for the French concept of permanently organizing its ground forces as combined arms units.

COLONEL ARNAUD P. LOUBENS was commissioned in Armor upon graduation from Saint-Cyr Military Academy in 1950. He has served in Vietnam, Algeria, Ethiopia, and Germany. He is a 1960 graduate of the Paris Staff College and commanded the 2d Cuirassiers, an armored battalion equipped with *AMX-30* tanks. He is presently serving as the French liaison officer to the U.S. Army Armor Center and Fort Knox.

*This article appeared originally in the December 1979 issue of Defence Magazine under the title, "Further Thoughts on the Use of Stay-behind Armored Units in a Contemporary European War." It has been rewritten specifically for **ARMOR** and is reprinted with permission.*

Stay Behind Armored Units

by John F. Milsom

In the event of conventional war in Europe between Warsaw Pact (WP) and NATO forces, this will be predominantly an armored war. Published estimates place the current WP gun-tank strength in the West at about 40,000 (in reality, probably much higher). To this must be added at least the same quantity of armored infantry vehicles (BMPs and BTRs),[1] plus a whole multitude of armored supporting vehicles (self-propelled weapons, engineer, signal, reconnaissance vehicles, etc.) bringing the total estimated WP armored strength to somewhere in the region of 100,000 vehicles.[2]

The SP armor would, according to available information, attack on a broad front, probably all along the line of contact, with follow-up waves everywhere. The allocation of forces on this broad front is to conceal the axes of the main blow and to tie down NATO forces across the entire front. It is almost certain that some of these axes will be directed along NATO interformation boundaries. All indications show that the WP units will just "motor," bypassing opposition, and thrusting as fast and as far as they can into the heart of Western Europe. The standard rate of advance is put at 100 kilometers a day. The Soviets are likely to lead with an armored-infantry formation, followed by tank formations in the second and third waves on the axes of the main blow.

In order to meet this armor, NATO envisages using a series of "aggressive delays" (withdrawal actions.) These comprise defense in depth with battle groups withdrawing through one another in an effort to achieve maximum attrition of WP ground forces without actually becoming embroiled in direct combat to the extent that WP armor may bypass and eventually envelop them. To achieve this strategy, NATO will make

maximum use of its heavily outnumbered armored forces. However sophisticated this strategy may be, it can be seen to be totally defensive. Large areas of Western Europe will be surrendered as a "killing ground" for WP armor. There would be no capability for recovering these areas, any attempt to do so being suicidal, especially with the ratio of forces involved. Even if the WP forces are halted after these areas are lost, there is nothing to stop them from starting all over again at some future time, progressively absorbing more and more of Western Europe while the U.S. and European Governments attempt to decide as to whether they should "go nuclear" or not. A defensive strategy *must* envisage either the loss of minimal ground in halting an enemy attack *or* the capability of regaining ground once the attack has been defeated. These are *basic* rules of armored warfare.

Even if NATO could spare units of gun-tanks for counterattack operations (and these would be almost farcial in size) they would have to tear their way through at least three waves of

WP gun-tanks and BMPs/BTRs in a direct frontal attack with almost infinitesimal probability of surviving long enough to achieve any operational successes behind the enemy combat units.

What are the aims in penetrating behind the enemy lines? There are four main ones:

To swing around and take the enemy in the rear, acting as a second front for the defenders and bringing WP forces into a cross-fire situation. Here it should also be borne in mind that:

- All the most sensitive and vital equipment, units and organizations are located towards the rear;

• All Soviets armored fighting vehicles (AFVs) have maximum armor on the frontal arc, and penetration from the rear is very much easier;

• It would be more difficult for Soviet arms to identify and engage armored targets in their own rear.

To destroy local fire-support means—particularly artillery and multibarrel rocket launcher units (which are, at the moment, unarmored)[3].

To encircle groups of forces and cut them off from their logistical tail.

To destroy nerve centres, supply areas, HQs, convoys, etc.

The author wishes here to propose a method of achieving these aims—not necessarily completely—but certainly more effectively and cheaply, in terms of cost of equipment and manpower, than any method so far brought to his attention. The prime aim is to deplete the WP forces and disorganize its groupings of forces to such an extent that the application of conventional counterattack (or counteroffensive) is both feasible and practicable. What makes this so very much more difficult to achieve is that any proposition put forward must be applicable within the existing organization of arms and services, the existing strategic and tactical deployment, and utilizing already existing equipment. At the same time, the availability of AFVs within the NATO forces is so scant that minimum risk of losses through attrition must be ensured. The author will attempt to propose some cheap, reliable, and effective means of increasing the "armor-defeating capability" of NATO combat units but, sad to say, the NATO defense setup cannot think cheap. As soon as anyone talks about mounting any kind of weapon in an armored turret, immediately it involves the incorporation of a mass of electronics (with its implicit reliability problems) and an $N,000 cupola!

Be that as it may, the question to be asked is: "In order to counterattack on one's own surrendered territory, is it necessary to penetrate the frontal shield of the advancing enemy?" Why not leave units of armored vehicles behind as the aggressive delay is executed, allowing the "armored shield" of the WP forces to advance, and then reappear at the required time to atack important targets? To achieve the requirements listed above as effectively as possible, would require three levels of "Stay-Behind Armored Units" (SBAUs):

• Gun-tanks, self-propelled weapons and/or mobile armored turrets, to hit the forward WP armor in the rear and then cut through, back to their own lines;

• Light armored vehicles to take on the supporting artillery and rocket launcher units; with the completion of their task these would execute skirmishing raids until they had run out of ammunition or fuel;

• Light armored vehicles that remain behind long-term in "hides" for use against important rear area targets as they deploy in their vicinity.

Before progressing any further, it is obvious that to develop sound operational procedures for the exploitation of these SBAUs would require concerted trials on the ground, and "gaming," by experienced teams of scientists and service personnel. All that the author can propose are general concepts and guidelines.

It should be realized that even if the WP attempt to seek out these units prior to the attack, this will in itelf achieve an important aim in allowing the main defense force maximum time to deploy on the new aggressive-delay position as well as carry out any engineer work in front of that position.

First Type of SBAU

The current NATO philosophy appears to be the concentration of all possible firepower upon the destruction of SP gun-tanks, but surely the greatest threat to NATO lies in the BMPs of the motor-rifle divisions? Tanks can take ground but they cannot hold it, whereas mechanized infantry can both take ground *and* hold it. Without direct infantry support the Soviet gun-tanks would be loath to probe too far ahead, so that one effective way to halt the tanks is to decimate the BMPs. If one analyzes the reasons for the stagnation in mobile operations during the first half of the First World War, one of the predominant factors was the extreme effectivenss of the machinegun against unprotected infantry. This was overcome to some extent by the introduction of the "infantry-accompanying tank" and more effectively so during the Second World War through the use of armored infantry carriers. Modern NATO and WP ground force deployments are only streamlined versions of those being applied towards the end of the Second World War (with the exception of the introduction of nuclear weapons). To restore the stand-off situation as occurred in the First World War, i.e. to remove the capability of attacking infantry to advance to contact, what is required is to uprate the machinegun concept to allow the rapid and widespread destruction of the enemy BMPs.

To do this effectively, NATO requires a light armored vehicle with a 25 or 30-mm caliber, high rate-of-fire, armor-piercing weapon. It's mobility needs to be good—at least on a par with the *Scorpion*—so that it may redeploy quickly to achieve maximum harassing effect and make a rapid withdrawal from the SBAU position. The type of vehicle envisaged might be similar to a *Scorpion* but equipped with a multibarrelled 30-mm *GAU-8* gun[4], and stripped of all unnecessary stowage so as to allow maximum room for ammunition and fuel. Only two crew members would be required—a driver and a commander/gunner. It might be necessary to carry ammunition externally in armored pods, or to tow an armored ammunition trailer, to achieve adequate fire density against massed enemy BMPs, but in either case the design should be such that the ammunition feed to the gun is never interrupted for more than a few seconds when changing from one ammunition container to another.

These SBAUs could also use dismounted 105- or 120-mm tank guns as a cheap form of antitank weapon—cheap as regards finance and manpower. These guns could take the form of mobile armored turrets mounted on bogie units and towed by light armored vehicles.[5] Each unit would be manned by a gunner and a loader who would tow the turret to its deployment position, unload it from its bogie, and stake it to the ground by a hydraulic mechanism or some other means.

Tactical Use of First-level SBUAs

Equipment aside, let us discuss the tactical utilization of these first-level SBAUs.

For some time the Soviet military press has been discussing the best way in which to use the BMP armored infantry vehicle in the attack. The current accepted doctrine appears to be as follows. An attack on a prepared defensive position will normally require the troops to dismount and attack on foot, in close cooperation with accompanying armor and under cover of well-coordinated artillery fire. Normally, in actual battle, deployment into attack formation will be carried out no more than 1,000 meters from the NATO FEBA,[6] and infantry will dismount at between 400 meters and 300 meters from the

NATO FEBA. These manned BMPs are most vulnerable during the period when they are closing from 1,000 to 400 meters from the NATO FEBA. This is the time when the first-level SBAUs should engage enemy targets.

The gun-tanks, mobile armored turrets and/or SP 30-mm *GAU-8s,* should be located off roads, in hides, between likely WP routes of advance. During the stand on the aggressive-delay position, the first-level SBAUs would engage enemy armor from the rear (particularly BMP/BTRs), constantly changing their firing positions, until the situation became too "hot" to stay around, and with the chaos of the fire-fight taking place between the FEBAs, it would be extremely difficult for WP armor to locate and identify these individual NATO SBAUs.

The greatest problem here (gun-tank case) is to extricate the gun-tanks and get as many as possible safely back to the NATO lines for use in further operations. (This would not be necessary with armored turrets, which could be destroyed and abandoned).[7]

At the time selected for the SBAUs to retire (gun-tank case), the greatest chance of survival would be to thrust through the massed array of BMPs (hiding the foxes among the sheep, so to speak), at the same time táking on armored targets on the move, at point-blank range. If this takes place in daylight, then it would be expedient to cover this maneuver with artillery fire (HE and smoke), thereby prohibiting the crews of the BMPs from deploying their infantry antitank weapons. The BMP gun and ATGM, would in this situation, be ineffective against the NATO gun-tanks. At the same time, the WP tank units would be loath to engage a minority of fast-moving gun-tanks weaving in and out of their own BMP mass.

As the BMPs are depleted, the WP gun-tanks would feel more and more insecure with being "out front"—particularly with their thinly-armored rears exposed to the guns of these NATO SBAUs.

The period ot greatest threat to these SBAUs would be in covering the open ground from the area of the BMPs to the aggressive-delay position. This would have to be taken into account during the initial planning of the aggressive-delay position and SBAU locations (i.e. availability of dead ground or concealed exits from the "killing zone"). Artillery could assist by laying down smoke, and all NATO units should concentrate on keeping the WP antitank means busy. The threat to the NATO gun-tanks is even greater by virtue of the fact that they will be exposing *their* thinly-armored rears to WP antitank means. A possible technological solution to this problem could be up-armor the rears of these special SBAU gun-tanks, even depleting frontal armour to do so. It would also be expedient if the SBAU gun-tanks worked their way back to NATO lines in a series of bounds from cover to cover, with some covering the retreat of the remainder.

Second Type of SBAU

The light armored vehicles (light tanks or armored wheeled vehicles) would be deployed in hides well behind the selected "killing zone." Ideally, what would be required are fast wheeled vehicles armed with multibarrel rifle-caliber machinguns, armored against small-arms fire only, and cheap enough to be considered expendable.[8] These vehicles would be concealed prior to the WP advance and supported by an observer dug-in at some advantageous high-point. At the time the WP artillery units began to deploy, the observer would transmit the location and conditions to the SBAUs. Operating as a skirmishing force, the SBAUs would make full speed for the identified locations and take them by surprise, possibly meeting very little organized opposition. After "strafing" everything in sight, they would retire to hide positions and, depending on the situation, either continue further skirmishing raids until out of fuel or ammunition, or destroy their vehicles and work their way back to the aggressive-delay position.

Third Type of SBAU

In this case the tactics would be almost identical to those of the second type, but here the targets would be key rear area organizations (HQs, supply dumps, transport columns, etc). In preparing for any high-speed offensive, we must expect the Soviet Army to establish its supply bases and HQs well forward along all axes of advance. The effect on rear areas would be almost inconceivable if about 100 light armored vehicles, armed with small-caliber, rapid-firing machineguns, were allowed to run amok on these kinds of skirmishing raids. Any WP attempt to offset this would tie up large quantities of force intended for front operations.

If it was possible to procure a number of light armored self-propelled antitank guns, then these latter types of units could take on WP armored units while they are advancing in col-

umns down roads. By hitting the front and rear vehicles first, the columns could be immobilized, leaving the other vehicles of the column open to attack from the flanks.[9]

For the latter two types of SBAU, there are three basic problems to be solved:

- Making the vehicles undetectable by the enemy;
- Making them logistically free from their own lines—particularly a high-level mechanical reliability;
- Maximizing their changes of achieving surprise when attacking their objectives.

The solution to these problems can only be achieved correctly by the various military and civilian teams of the appropriate defense organizations, but, to show that they are not insoluble, the author will propose some ideas of his own.

Making the Vehicles Almost Undetectable

In the case of the first type of SBAU, it would be expedient to disguise the NATO armor as current Soviet models, thereby making it even more difficult for the WP forces to identify them.[10] So long as the vehicles are deployed under cover in areas of bad-going, it is almost certain that they will not be discovered by the advanced echelons or teeth arms which, as already described, will be advancing down roads and across good-going as fast as possible.

In the case of the other two types of SBAU, basically the light armored vehicle would have to be buried in a hide of some form—possibly reversed into a hole in a bank, covered up, and provided with a dozer blade to extricate itself when necessary. Places would have to be selected near or along WP lines of advance, and in an environment where the use of sophisticated detection equipment would be encumbered by local artificial or natural features. Placebos could be deployed to reduce detection probability even further.

Making the Vehicles Logistically Free

This entails the logistical principle of total self-containment. Either the vehicles could be modified to carry extra fuel and ammunition (armored pods or trailers), or replenishment subunits would have to be deployed along with them. Replenishment of ammunition, POL, and rations would best be done from stockpiles laid out prior to the outbreak of hostilities. Stockpiling of ammunition and POL is not necessarily efficient. Many dumps may not be used because they are too far removed from the Soviet line of advance and other dumps may be overrun by the enemy before they can be used, but efficiency in wartime cannot be measured in terms of peacetime parameters. Stockpiling ammunition, POL, and rations would give the light armored vehicles of the SBAUs the ability to move fast and would increase thier flexibility in deployment. Vehicle repair would be out of the question, and immobilized vehicles would have to be abandoned, probably after being destroyed or cannibalized.

Maximizing Chances of Achieving Surprise

This is difficult to generalize. In essence it depends upon the local conditions and the capabilities of the commander and his men. It would be advantageous, however, if the communication route between the SBAU hide position and the objective, as well as the surrounding terrain, was clearly visible to the observer on the high point. As mentioned earlier, it would also greatly improve the chances of achieving surprise and of reaching the objective unmolested, if the vehicles could be disguised as current WP models.

Conclusion

To sum up, the fact remains that however NATO general staffs envisage the exploitation of armor *behind* WP lines, they *must* ensure some capability to do so. The armored equipment of the first type of SBAUs will be able to take on targets from the rear, where penetration is easy and guarantees a total "kill." It can achieve a high kill rate with virtually negligible probability of being located while in the SBAU position. The AFVs of the remaining two types of SBAUs do *not* need to be heavily-armored, sophisticated, and costly gun-tanks such as those that would be imperative for conventional frontal (or even flank) breakthrough operations. The units will not have to accept significant losses during penetration of the forward enemy teeth-arms, and can effect maximum surprise. It is, therefore, considered that the concept of exploiting "Stay-Behind Armoured Units" is worthy of more detailed and thorough investigation—particularly as to the practicability of making AFVs undetectable to the enemy.

Footnotes

[1]BMP and BTR are acronyms for "*Boevoy Mashina Pekhoti*" (infantry fighting vehicle) and "*Bronetransporter*" (armored carrier) respectively.

[2]Working on the basis that there are about 120 motor-rifle divisions (each with about 200 tanks and 350 APC/IFVs) and 50 tank divisions (each with about 340 tanks and 170 APC/IFVs), this gives a total of approximately 41,000 tanks and 50,500 armored infantry vehicles.

[3]Although the Soviet Army is currently in the process of introducing armored mobile artillery equipments (*SAU-122* and *SAU-152*), it is considered likely that these will operate well forward organic to the tank and motor-rifle troops.

[4]General Electric *GAU-8/A Avenger* 30-mm rotary cannon firing DUAPDS (depleted-uranium, armour-piercing, discarding-sabot) ammunition.

[5]This idea was considered in detail by the German Ordnance Department (*Heereswaffenamt*) at a very late stage in the war, resulting in the *Heuschrecke* (grasshopper) program. Here the concept was more complex in that the turret could be mounted on the carrier vehicle to operate as conventional SP field artillery or be removed by a special lifting device attached to the vehicle. A chain of turrets could be towed behind on bogies. The program was never taken further than the prototype stage, however, due to priorities in other areas of AFV production, shortages in raw materials, and the eventual termination of the war.

[6]FEBA is an acronym for "forward edge of the battle area."

[7]It might be wise to abandon the *GAU-8* vehicles as well. In the case of those units which do abandon their equipment, the crews might best be selected from special operations troops (SAS, etc), who are thoroughly trained in the techniques of working their way back to their own lines. They are also well-versed in the techniques of concealment.

[8]Note on this the current U.S. Combat Support Vehicles Program (*XM 966*), in particular the *Cheetah*. This is a small, light, fast, long-range, 4-wheeled all-terrain armored vehicle incorporating off-the-shelf sytems.

[9]As an example, note the highly-effective application of this tactic by a single *Tiger* tank (under the command of Obersturmfuuhrer M. Wittmann) of 501st Heavy SS Tank Battalion against a British tank column at Villers Bocage, on the Caen road, France, June 13, 1944. This technique also proved highly effective when employed by the Finns against the long Soviet armor columns advancing into Finland in the Autumn and Winter of 1939.

[10]Note on this the application of this technique by the Germans in the Malmedy area of Belgium in December 1944, where several (about 10) *Panther* tanks were disguised to resemble U.S. *M-10* tank destroyers.

Hip Pocket Artillery

by First Lieutenant Scott LeCraw

Although there has been some discussion about the possibility of dropping the 4.2-in mortar from the inventory, it will more than likely be with us for a while. Therefore, it is imperative that we understand the weapon's capabilities and limitations to ensure that it is used most effectively.

The battalion heavy mortar platoon is one of the most unique units in the combat maneuver battalion. Its uniqueness stems primarily from the fact that it is an indirect fire weapon, but unlike most indirect fire systems, it *belongs* to the commander. It is his to develop and train—he establishes the policies and priorities.

The mortar platoon is the commander's "hip pocket artillery." As such, it can provide rapid, dedicated fire support. The mortar, however, is not an artillery piece and there are distinct differences between the two, and in order to use the mortar platoon to its full advantage, its capabilities and limitations must be understood.

The mortar platoon is much more mobile than an artillery battery, because it has only four mortar carriers, a fire direction center (FDC) mounted in an *M-577A1,* and the platoon leader's ¼-ton truck. It also presents a much smaller target on the battlefield, allowing it to be moved farther forward.

One characteristic of the mortar, however, is both an advantage and a disadvantage. Its high angle-of-fire leaves the round in the air longer, increasing time of flight and allowing more time for the round's trajectory to be affected by wind. On the other hand, the round is going almost straight down at the end of its trajectory, allowing fire over high obstructions. This capability becomes extremely important in mountainous terrain. It also allows the mortars to fire from behind a high hill that affords protection from artillery counterbattery fire.

By far the mortar platoon's greatest advantage over artillery, though, is its heavy volume of fire, both in rapid and sustained fire. The maximum and sustained rates of fire for a 4.2-in mortar and 155-mm howitzer are compared in Table 1. Assuming a four-gun mortar platoon and a six-gun artillery battery, the mortar platoon firing at its maximum rate can have 72 rounds on target in 1 minute and 180 rounds in 5; whereas the artillery battery can fire only 24 rounds in 1 minute and 84 in 5. In 30 minutes of firing at the sustained rate, the mortar platoon can fire 360 rounds, while the artillery battery can fire only 180.

The most visible of the mortar's limitations is its range. Although the 4.2-in mortar's range of 5,650 meters seems sufficient, it is not the realistic combat range. Mortars are positioned, approximately 800-1,000 meters behind the forward element of the battalion and 300-500 meters must be subtracted in planning to allow for heavy winds. These two factors combine to give a planning range from the forward maneuver element of 4,000-4,500 meters. While this is more than enough range, it must be remembered that quite often in open terrain there will be areas where visibility is 6,000-7,000. During a live-fire exercise conducted at Fort Irwin, CA, my mortar platoon received numerous calls-for-fire on targets that were 8,000-10,000 meters distant. This resulted in a needless delay for the frontline commander because he wasted precious time contacting the mortars only to be told his targets were out of range.

When the 27-lb mortar round is compared with a 95-lb artillery projectile it seems rather small. At first glance, this may seem to be a drastic disadvantage. But when volume of fire is considered in conjunction with projectile weight, the mortar round fares better. In the earlier example of volume of fire, we gave the mortars 72 rounds in 1 minute and the artillery 24.

Table 1. Rates of fire.

	Maximum	Sustained
Mortar, 4.2-in	18 rds per min for 1 min or 9 rds per min for 5 min	3 rds per min
Howitzer, 155-mm, SP	4 rds per min	Chg 1-7: 1 rd per min Chg 8: 1 rd per min for 60 min; 1 rd per 3 min thereafter.

When total pounds of projectile on target is computed, the artillery has the edge of 2,280, but the mortars are close behind with 1,944.

The problem of ammunition stockage and resupply is unique to mortars and it is a problem that can bring the best fire support planning to a grinding halt.

Let's first address resupply. The great advantage of the mortar which has been emphasized up to this point is its high volume of fire. This, however, creates a huge resupply problem. The only place within the platoon where ammunition can be stored is the racks in the mortar carriers. There is no organic storage or resupply vehicle and the platoon's *M-106A1* carriers have a collective capacity of only 352 rounds. This load can be expended in 19½ minutes when firing at the maximum rate for 5 minutes and then continuing at the sustained rate. While this may seem an unlikely occurrence, I have had the unfortunate experience of expending all my ammunition after 30 minutes in a movement to contact—an experience that was made even more unfortunate by the fact that the battalion commander called me for increased fire on a critical target just as my last rounds went out the tubes.

This lack of ammunition storage space puts a tremendous drain on the battalion ammunition section, one with which they will be unable to cope in a real combat situation. During the live-five exercises mentioned above, the ammunition section spent at least half their time resupplying my platoon. This was possible solely because the tanks were being loaded with only 15-20 rounds per operation. In a real situation where the tanks need their full basic load, the mortar platoon is going to be assigned a low priority, and rightly so, and the platoon will spend time sitting on their hands when they should be supporting the battalion.

To alleviate this situation, I propose that the battalion mortar platoon, like the artillery battery, be assigned some type of organic ammunition resupply vehicle. The vehicle should be tracked to ensure that it can go wherever the platoon goes. The *M-548* ammunition carrier which the artillery uses would be ideal, regardless of what battalion motor officers think about the vehicle. As an interim measure, the possibility of a cargo trailer should be considered. We towed a 1½-ton trailer behind an *M-577* a few times with some success. It slowed mobility a bit, but gave us 150-200 additional rounds.

Another major problem area is ammunition stockage, particularly the mix of the basic load. The mortar platoon will spend almost its entire time in combat operating against enemy armor and mechanized units, against which the 4.2-in high explosive (HE) round has little effect other than forcing them to button up. The ammunition which will be used most is smoke. Therefore, the basic load should be smoke-heavy. However, due to the need to store the white phosphorus (WP) round upright, the *M-106A1* mortar carrier only has the capability to carry 25 rounds of WP in its total load of 88. These 100 WP rounds carried by the platoon can be fired in less than 3 minutes! The solution to this is to apply modification to the carrier to increase the WP storage racks, and change the mix to something like 40 WP, 28 illumination, and 20 HE.

There are texts available that discuss tactical employment of the battalion mortar platoon, therefore, the intent of what follows is not to establish doctrine, but to point out a few problem areas based on personal experience.

In all offensive operations, it is very difficult to use the mortar platoon from more than one position. Ordinarily, the battalion is moving close to full speed. By the time the platoon can break down the old position and move up to the battalion and occupy another position, the targets to be engaged are 3,500-4,000 meters from the mortar position. Within a very few minutes, the targets are again out of range.

The best use of the platoon is to have them follow the lead elements to within 2,500-3,000 meters of the objective. This will allow effective support on the objective and, just as important, behind the objective.

In the exploitation, it is next to impossible to use the mortars for more than one or two missions because the battalion simply cannot afford the time required to adjust the mortars onto the target. In this rapidly moving situation, the mortars should again follow the lead element and be held until any *real* oposition is met. In this way, the mortars can be used to help break through and continue the battalion's penetration.

Where the mortars truly come into their own is in the defense. Given sufficient time to prepare subsequent positions the only down-time when no targets can be serviced is the time enroute between positions. When firing at a preplanned target from a well-prepared position, the platoon can have an eight-round fire-for-effect on target within 1½ minutes of occupation.

In conclusion, the mortar platoon must be understood to be used to their maximum potential. Most of the above will not be found in textbooks. It is the kind of knowledge which comes from training and operating with the mortar platoon in diverse situations. With a full understanding of the unique capabilities and limitations of the battalion heavy mortar platoon and with proper utilization, it can be an asset that assists in achieving victory on the battlefield.

FIRST LIEUTENANT SCOTT LeCRAW was commissioned in Armor from Washington & Lee University in 1976. After completing AOB, he was assigned to 5th Bn, 33d Armor, where he served as tank platoon leader, S-3 air, mortar platoon leader and CSC XO. A graduate of the Motor Officer's Course, he is currently assigned as an operations officer, II ROTC Region, Fort Knox.

PROFESSIONAL THOUGHTS

How Much Close Support?

Whenever members of the combined arms team meet, it seems that there is one question which is invariably posed to the field artilleryman—"How much close support are you going to give me?" and the question is generally expounded upon with the term "Golden Tubes."

Let me begin by clearing the air on the "Golden Tube" concept. The field artillery research and development efforts do not currently call for consideration of gold as a primary metal for field artillery cannon tubes, this being based on both a wear factor and the cost.

With regard to "How much close support are you going to give me?" The answer is 100 percent, because all field artillery fires belong to the maneuver commander. The maneuver commander is faced with a variety of threats. The enemy may attack him with electronic warfare, indirect fires, direct fires, or from the air. The field artillery can counter some of these threats—specifically, the direct and indirect fires. If we want to equate these to categories of fire, countering the enemy's direct fires would be termed "close support" and countering indirect fires would be termed "counterfire."

To the man on the ground, it does not seem that there is much difference between counterfire and close support—both are aimed at stopping the enemy's ability to kill him. From a field artillerymen's viewpoint, the enemy indirect fires are its greatest threat—but the field artillery doesn't deliver fires to support itself—the field artillery delivers fires to support the maneuver forces. There are those who would like to place a percentage figure on counterfire and close support and, to satisfy those individuals, the following is offered.

If the maneuver commander is taking 100 percent of his casualties based on enemy direct fires, he could direct that 100 percent of the field artillery be devoted to close support. If the maneuver commander is taking 50 percent of his casualties because of enemy direct fires and 50 percent because of enemy artillery, he may then direct his field artillery to devote 50 percent to close support and 50 percent to counterfire. It is the maneuver commander's call on the apportionment of field artillery fires.

Looking further into the question, the term "interdiction" pops up. As I stated, the field artillery can shoot at the people who are shooting at our soldiers. Now with interdiction, the only difference is that we are shooting at the enemy before he has an opportunity to shoot at our soldiers. To me, a soldier's viewpoint of field artillery fires should be:

Close Support—Attack of the enemy's direct fire weapons which are *shooting at me.*

Counterfire—Attack of the enemy's indirect fire weapons which are *shooting at me.*

Interdiction—Attack of the enemy before he can begin *shooting at me.*

Suppression of enemy air defenses—Attack of the enemy's air defenses so that our Air Force can shoot the enemy *shooting at me.*

Summing this all up, the field artillery fires in support of the maneuver command and in reality shoots only one type of fire—that which supports the soldier.

JOHN E. DONOHUE
Colonel, Field Artillery
USAFAS

Escape and Evasion Training for Tankers

We train extensively for a mobile conflict that will involve thousands of armored vehicles and precision gunnery. The battlefield will be littered with tanks, personnel carriers, and self-propelled guns. The crews of some of these "Brew Ups," as the British call them, will be fortunate enough to abandon their disabled vehicles, others will not. Those who do survive may be wounded or dazed, and they will probably be very tired—some will be surrounded by the enemy and face the grim choice of submitting to immediate capture or attempting to reach their own lines.

We spend a lot of time teaching our crews how to move, shoot, and communicate, but we fail to teach them how to evade or escape capture, survive, and rejoin friendly forces.

Personnel replacement will be difficult enough without automatically writing off the crews of all the fighting vehicles that are seen burning or disabled on the battlefield. We need to establish a training program that will give our armored vehicle crewmen the ability to survive and fight again.

This training should include such topics as map reading, terrain analysis, land navigation, the use of cover and concealment, and survival under various climatic conditions on different types of terrain. Granted, these subjects are taught at training centers, but they are not stressed for armored crewmen during unit training. Escape and evasion for tankers should begin with instruction in how to prevent their vehicle from being recovered and repaired by the enemy and used against us. This would include destruction of radios and fire control equipment and the use of thermite grenades to set fire

to the vehicle should that be necessary. The initial phase of the training would also include a list of the equipment the crew should take with them when they abandon their track—.45 cal pistols, submachineguns, the coax machinegun, web equipment, first aid equipment, and maps.

The next block of instruction would include those topics which are crucial to the success of the program—map reading; land navigation; and escape, evasion, and survival techniques. These subjects could be integrated with other training and crew proficiency in their application could be tested during routine field training exercises without additional cost to the unit.

To conduct the test, a crew would be told that their tank has been hit, they are surrounded, and one or more of them is wounded. They would then be required to make their way back to friendly forces through an aggessor unit (the scout platoon perhaps) which is searching for them. The crew would be accompanied by an evaluator who would score their actions, but the ultimate test of their proficiency would be in whether or not they evade or escape capture and "survive to fight again."

CRAIG C. MOSHER
Specialist 5
K/3/3 ACR

Editor's Note: Recently, I read some comments by a World War II German general concerning casualties to German tank crews. The general said that most of the casualties to his tankers came after their tanks had been destroyed and they had to fight as dismounted infantrymen.

The Company Chaplain

In the area of leadership, the company commander occupies the position where "the rubber meets the road." Senior officers, who almost without exception were outstanding company commanders, look back to that position with fond memories. "That was the last time I knew all my soldiers in the unit by name," is a comment they frequently make. It's a good assignment, but it's also a tough one. And being a good company commander, is a real challenge to any officer.

To begin with, the "old man" in the company doesn't feel too old and really shouldn't in his/her mid-twenties. Youth has its advantages—strength, energy, enthusiasm, openness—but, also, it normally indicates limited experience. A company commander needs experience to lead soldiers in the Army. To learn the military aspects of commanding a company is difficult, but perhaps even more difficult and complex is to own the responsibility for the overall welfare and well being of a large number of soldiers.

The company commander is not alone. He has a handful of young lieutenants with even less experience and another handful of experienced, senior noncommissioned officers. This is the leadership team for the company and its young soldiers. The leadership team and the commander find that an awful lot of time and energy to into leading, motivating, and supporting company personnel. The commander is the final decision maker on many personnel issues which involve a full range of personal problems. Experience would be invaluable, but experience is often limited.

A Specialist 5 is at the military police station accused of child abuse, while the medics struggle to save the young child's life. Two Privates First Class and a Staff Sergeant have financial problems as letters of indebtedness mount. Specialist 4 Jackson was a motivated soldier for a year, but he is suddenly withdrawn, moody, and unresponsive. Private First Class Carrol and his wife are struggling to keep a troubled marriage together. Two soldiers are devleoping alcohol problems, while another section is coming apart on racial issues. Roughly a tenth of the company in trouble—that's not unusual—but the problems are complex and require immediate attention.

Every company has a chaplain and the company commander should know that chaplain well. AR 165-20 describes unit, area, and denominational ministry in terms which spell out chaplains' responsibilities for each unit and soldier in the Army. The company's chaplain may be part of the battalion, brigade, or group staff, but one chaplain has responsibility for unit ministry to every company. The chaplain can be a real asset in dealing with soldier problems which erode the effectiveness of soldiers' mission performance or turn their lives into shambles.

The chaplain cannot solve all problems, but he can provide support to the company commander who may be overburdened with the "loneliness of command", and the chaplain can provide support to the company personnel individually or collectively. A wise company commander perceives the unit chaplain both as a friend and source of expert help.

Chaplains work far more effectively when they are part of a helping team in the unit. Take a half hour to meet the chaplain and get acquainted. Invite the chaplain to visit the company, see the facilities, meet the personnel, and even make a few comments the next time the leadership team assembles for training. The chaplain is assigned to a higher headquarters, but he can become part of the support team for the company commander. In a time when requirements always seem to be increasing, the chaplain, whose mission is to help, can be a real blessing.

WILLIAM J. HUGHES
Lieutenant Colonel, Chaplain
USACHC

NOTES

Production XM-1 Rollout - - 28 Feb 1980

The first two production models of the *XM-1 Abrams* tank were delivered to the U.S. Army during ceremonies at the Lima, Ohio Army Tank Plant 28 February 1980. The new main battle tank is named in honor of the late Army of Staff, General Creighton W. Abrams. It is the first all-new tank to roll off the line in over two decades.

Mrs. Julie Abrams, the general's widow, christened the new series of main battle tanks by breaking the traditional bottle of champagne on the bore evacuator of tank No. 1 which bore the name "Thunderbolt"—a name made famous in World War II. Thirty-six years ago, Lieutenant Colonel Creighton W. Abrams, mounted in an *M-4* tank named "Thunderbolt," led the 37th Tank Battalion in the breakout to relieve the 101st Airborne Division encircled at Bastogne.

Army Chief of Staff General E. C. Meyer signed DD Form 250 officially accepting delivery of tank Number 1, while Dr. Percy Pierre, Assistant Secretary of the Army for Research, Development and Acquisition, signed for tank Number 2. Chrysler crews then turned over the equipment logbooks to crews from Company H, 2d Squadron, 6th Cavalry Fort Knox, who demonstrated the tank's speed and agility on the test track.

Staff Sergeant Tom E. Norris, commander of "Thunderbolt," said that as the tank circled the test track, he was asking himself, "Can we go any faster?" At the time, "We were traveling 50 to 52 mph," he added.

The *XM-1 Abrams* is being produced at the Lima Army Tank Plant, which was built in 1942 and used for modifying the *M-4 Sherman*. After a period as an Ordnance Vehicle Maintenance School, the plant was inactivated in 1959. It was reactivated and enlarged in 1978 to operate the first *XM-1* assembly line. Currently, the only other active tank assembly operation is the Detroit Army Tank Plant, where *M-60*-series tanks are produced.

The Lima Plant will produce 110 *Abrams* the first year. The Army has received authority to order 352 tanks during the second year, as monthly production rises to 30 tanks.

Later, as *M-60* production is phased out at the Detroit plant, and that assembly line is converted to *XM-1* manufacturing, a peak surge capacity of 110 tanks a month becomes possible.

Editor's Note: An article and photo feature on the Lima Army Tank Plant is planned for a future issue.

IFV/CFV Type Classified "Standard"

The Department of the Army recently type classified "standard" the *M-2* Infantry Fighting Vehicle (IFV), *M-3* Cavalry Fighting Vehicle (CFV), *M-242* 25-mm automatic cannon, and *M-231* firing port weapon for the IFV. In separate actions the 25-mm ammunition and the *M-240C* coaxial machinegun were also type classified "standard." The Department of Defense approved the Army action and authorized full scale production. The first year's production will be 75 IFVs and 25 CFVs with the first vehicles coming off the FMC Corporation production line in May 1981. The production rate will increase annually and reach 90 vehicles per month in 1985.

The U.S. Army Armor Center and Fort Knox is currently in the planning and training phase for conducting a Force Development Test and Evaluation (FDT&E) of the CFV. Training is to commence 7 April, with testing starting at the end of May and concluding in early August. The primary purpose of the FDT&E is to test the cavalry training and organizational maintenance packages, tactics, and doctrine for the CFV. During the test, which will be conducted by the US Army Armor and Engineer Board, five IFVs will be evaluated in an armored cavalry platoon organization that will also have four *XM-1* tanks. In addition to the training issues, several hardware changes designed to correct minor deficiencies found in earlier testing will also be evaluated. Lessons learned from this test will be incorporated into the institutional and exportable training package for the CFV.

OPMD - EPMD ARMOR

OPMD

Review of Education and Training for Officers (RETO)

In August 1977, a select group of officers was appointed by the Chief of Staff of the Army to evaluate officer training and education. As a result of their study, a world-wide analysis of officers jobs has been initiated. The United States Army Armor Center, as proponent for Specialty Code 12 (Armor Officer), will conduct a complete analysis of Armor Officer duty positions, as well as those in Specialty Code 15 (Armor Aviation) for which the USAARMC has proponency.

Information gained through this analysis will be instrumental in production of the following:

- A consistent officer education and training system progressing from precommissioning through senior field grade level.
- Realistic officer job data on which to base future training decisions.
- Elimination of repetitive training through management of common tasks (officer duties).

Preliminary analysis of Armor Officer jobs will be completed at Fort Knox by March 1980. Survey teams will then travel to Armor and Cavalry units in the continental U.S. and overseas to gather information from job incumbents and supervisors. The results of these surveys will be used to refine the initial listing of Armor Officer job descriptions.

Based on the analysis of these data, decisions will be made in the following areas:

Expansion of the Armor Officer Basic Course—present indications are that Officer Basic Course graduates, although technically proficient, are inadequately prepared for duties they encounter during their first 3 years of service.

Establishment of a Company Command Course (CCC)—it has been determined that almost 40 percent of Armor Officer Advanced Course attendees have previous command experience. A course of instruction just before taking command has been judged to be more useful. Such a CCC would be attended on a temporary duty basis. A decision to eliminate the present advanced course, or simply modify it, has not yet been made.

Establishment of Military Qualification Standards (MQS)—the purpose of MQS is to provide a method of uniform training and evaluation of company grade officer capabilities. It is anticipated that the format will resemble that of the Soldier's Manual. However, it will be self-paced, provide a professional reading list, and serve as a job guide to duties appropriate to a particular grade level. The MQS will serve as a GO/NO GO indicator only. There will be no progress information included in efficiency reports.

This RETO program is not an example of crisis management. It will develop logically and be constantly refined. It began in 1977, and some elements will not be fully implemented until 1987. Nor is RETO a short-lived attempt at developing a coherent training program. Forecasts are being included that will define personnel and equipment needs into the 1990's. The end results of this program, however, will depend on the cooperation and information that is received from the Armor Community in the field.

The following questions and answers pertaining to the new Officer Evaluation Reporting system are a continuation of an article which appeared in the March-April 1980 issue of ARMOR.

Q. Why not forward the support form to DA along with the OER?

A. The support form is a working document designed to include the rated officer in the evaluation process, increase communication between supervisors and subordinates and improve both individual and unit performance. Experience with the 1976 field test of the system revealed that when an officer believed the support form was being forwarded to DA, its contents were overly formalized and often written for the benefit of DA and not the rating chain. This was not productive and officers who participated in the test agreed that the support form best serves its intended purpose (enhancing mission accomplishment and encouraging professional development) when it remains in the field and is used by those individuals most familiar with its contents.

Q. What role will the performance narrative play on the new report?

A. Previous OER systems have tended to dwell on potential related information without providing insight as to the specifics of performance. Selection boards have complained about this and expressed the necessity to preclude the use of vague, potential-oriented generalities on the OER. Therefore, the new system has been specifically designed to improve the quality of the performance narrative by better relating evaluation to the specifics of performance and by separating the performance and potential sections of the new report. The performance narrative on the new form is also much more structured than past OERs. The rater is referred to the information on the support form which forms the basis of what selection boards feel should be discussed in this part of the OER. (What did the rated officer do and how well did he do it?) Additionally, it is expected that as OPMS matures, the performance section of the OER will become increasingly more important in view of the impact of specialty guidance on the selection process.

Q. Why isn't there a requirement for the rated officer to sign a statement indicating he has seen and been counselled concerning the completed 67-8?

A. Other systems which have used this technique as a means

to encourage or direct counselling have not been very successful for two reasons. First, this technique has proven to be inflationary inasmuch as some rating chain members find it extremely difficult and unpleasant to communicate less than top evaluations to their subordinates. Second, counselling should be conducted continuously and systematically throughout the rating period and not just upon completion of an officer's OER. The most successful form of counselling is future-focused and developed out of natural discussion of organizational missions and tasks. This is one of the major purposes of the Support Form (DA Form 67-8-1).

A. With the increased focus on the narrative, doesn't the officer who works for a rater who writes well have an advantage over one who does not?

A. The ability of a rating official to portray clearly and concisely an officer's performance and potential has played an important role in every officer evaluation system. However, in the new system, the support form technique provides the rated officer with a unique opportunity to provide meaningful evaluation information to his rating chain as well as influence its input on the OER. Additionally, it should be noted that the narrative is not the sole makeup of the OER. There are also numerous "global" or objective evaluations along with a scalar rating in the Professional Attributes section (Part IV).

OPMS-U.S. Army Reserve

Officer Leaving Active Duty

Officers scheduled for release from active duty should contact Armor Branch, U.S. Army Reserve Component Personnel and Administration Center (RCPAC) prior to their separation date. Experience has demonstrated that early contact, preferably by phone, does much to insure a smooth transistion from Active to Reserve Component status.

During this initial conversation, your personnel management officer will explain the participation options available to you as a Reserve officer, and assist you in developing a career plan that will be compatible with your background, interests, and the demands of your civilian career. Again it is important that this process begin early, since delay may result in a new Reserve officer failing to meet minimum participation requirements during his first year in the program.

Directory

Armor Branch, RCPAC
Toll Free 1-800-325-1884
AUTOVON 693-7871

Mailing Address

Commander
U.S. Army RCPAC
AGUZ-OEC-AR
9700 Page Blvd.
St. Louis, MO 63132

Participation in the USAR

Reserve officers have a variety of training opportunities available to them, including:

- Troop Program Unit (TPU) Membership
- Assignments as Mobilization Designees (MOB DES)
- Active-Duty-for-Training (Individual Ready Reservists)
- Service School Attendance

The TPU is the mainstay of the Reserve Component Program, and as such, receives priority in the allocation of personnel.

Extensive troop unit experience is a career development goal for every reservists.

The MOB DES Program is equally important in terms of mobilization readiness, since it affords experienced officers the opportunity to train annually with the active organization they will serve with in the event of a national emergency. MOB DES officers generally serve 2 weeks of active duty with their agency each year and in many cases earn retirement credit during the year by working on assigned projects at home.

Similarly, other Individual Ready Reservists are afforded the opportunity to train with active army units each year and to serve in a variety of other active-duty-for-training assignments.

Reserve officers may complete career development service schools (the advanced course and Command and General Staff College) either in residence, through a USAR school, or by correspondence work. Additionally, officers accepted for the Logistics, Research and Development, and Foreign Area Officers Speciality programs may attend service schools appropriate to their speciality.

Officers who wish to inquire about these programs and their individual career progression should contact their Armor Branch PMO.

Officers Must Report Changes

USAR officers are required to report changes of status. Change in status includes address, marital status, number of dependents, and civilian employment. Changes in physical or mental conditions that keep individuals from meeting standards must also be reported.

Selected Reserve Unit members should contact their unit administration section or clerk.

Pretrained Individual Reservists, including all officers not in Selected Reserve Unit(s), should write: Commander, RCPAC, ATTN: AGUZ-RMR-D, 9700 Page Boulevard, St. Louis, MO 63132 (For changes in physical status use ATTN: AGUZ-RCH.)

Other methods for reporting changes that are available to *all* USAR officers include the USPS change of address kit, available from any Post Office; DA Form 3725, "Army Reserve Status and Address Verification," mailed annually to each reservist; or a call or letter to the personnel management officer (ATTN: AGUZ-OEC.)

Mobilization Speciality

Officer job specialties will no longer be identified as *primary* and *alternate*. Department of the Army officials say that the terms are being dropped because they imply a difference in importance of the specialties. Officers are expected to become equally qualified in two specialties. Officers enter the Army with one specialty and pick up another during their careers. Pretrained Individual Reservists as well as other Individual Ready Reservists are expected to maintain one qualification—their mobilization specialty.

BOOKS

SECURING THE SEAS: THE SOVIET NAVAL CHALLENGE AND WESTERN ALLIANCE OPTIONS by Paul H. Nitze, Leonard Sullivan, Jr. and the Atlantic Council Working Group on Securing the Seas. Westview Press, Boulder, Col. 1979. Hardbound, $24.00; Paperback, $12.00.

Securing the Seas is a definitive treatment of a vitally important subject. It is a thorough, careful, soundly-reasoned, objective analysis by two eminently qualified autorities. Paul Nitze, presently the chief spokesman for the anti-SALT, increased-defense forces, has a solid reputation in naval circles as the most intellectually impressive Secretary of the Navy in recent decades. Leonard Sullivan, although not previously known by this reviewer, holds high credentials and has had broad experience at the top levels of the Department of Defense. In this analysis they consider every relevant facet of every aspect of their subject, presenting opposing views where differences exist and making reasoned judgements in calm and lucid prose. As an indication of their thoroughness, the Table of Contents requires 10 pages; there are no less than 65 figures and tables and 50 photographs; appendices and bibliographical notes require another 10 pages of back matter.

Do not look in these 464 pages for drama or entertainment. Rather look for knowledge. And if it is true that wisdom is knowledge tempered by judgment, expect to gain in wisdom.

But if the security of these United States concerns you, expect also that your attention will be captured and the level of your anxiety raised appreciably. Because the very coolness of the logic, the comprehensiveness of the treatment and the calm authority of the style combine to render the conclusions all the more chilling to anyone with a knowledge of current defense budgetary policies and trends.

Two sample sentences will provide an idea of the conclusions, a feel for the authors' motivation and a taste of the style.

> "There is a stark contrast between the momentum of Soviet naval developments and the relative indecisiveness on the Alliance side. If this study succeeds in alerting Western planners to the potential problems ahead and contributes to a renewed dedication in the West to naval and maritime needs, then it will have served its purpose."

One hopes, with some fervor, that the authors' purpose will be served. But even if it is, more is needed than alerting planners and contributing to dedication. One gets the feeling that *Securing the Seas* demands a sequel, one perhaps not quite so calm and reasoned, one designed to alert not the planners but the man in the street whose freedom is at stake, one which might well begin "What the hell is the matter, my countrymen?"

EDWARD P. STAFFORD
Commander, USN (Ret)

A GUIDE TO THE STUDY AND USE OF MILITARY HISTORY. Edited by John E. Jessup and Robert W. Coakley. U.S. Government Printing Office, Washington, DC, Stock No. 008-029-001015-5, 507 pages, illustrated. Paperback $6.50 plus $1.00 shipping charge.

The Army's Center of Military History has just published *A Guide to the Study and Use of Military History.* Unfortunately, the work is mistitled; but more of that in a moment. Let me begin by noting that this work is an outgrowth of a concern that history—military history—was losing its primary role in the education of Army officers. This concern led to the formation of an *ad hoc* committee on the uses of military history within the Army; this *Guide* is one of the end-products, and perhaps one of the most important at that. The *Guide* begins with several chapters designed to provide the budding military historian, or the officer sitting down to commence his own study of the subject, some notion of the values and the pitfalls of military history as a substitute for experience and a guide to future war. The reader next discovers some useful notions of how to begin such a study; almost all the rest of the book is devoted to furnishing individual bibliographic chapters on each topic within military history: the great military historians and philosophers, American military history during the world wars, etc.

The authors of the work are either military officers serving in Army educational institutions, historians of the Army's Center of Military History, or noted civilian historians (like Theodore Ropp and Jay Luvaas) serving as visiting scholars at Army educational institutions. That is to say that the authors are all experts in their fields, and the *Guide* is, therefore, as close to authoritative as one can reasonably hope to get. Now no two historians will agree on which books should be mentioned when discussing, for example, the Civil War. These bibliographic commentaries therefore will not please everyone; furthermore it has been several years since most of these essays were written—they therefore leave out a number of important works published since then. But, all things considered, the *Guide's* bibliographies provide a benchmark and worthy starting point for a study of the Army's military history. Finally, the *Guide* closes with a number of short chapters describing the Army's historical institutions and collections, its art collection, and a perfunctory guide to institutions belonging to the other services and to other countries' institutions.

But who is kidding whom? *A Guide to the Study and Use of Military History* this is *not*. Three chapters of bibliographic essays are devoted to military history beyond the bounds of the U.S. Army; a further three short chapters (out of *23*) cover historical institutions outside the U.S. Army. This book is, in short, *A Guide to the Study and Use of the Military History of the United States Army.* Of course there is nothing wrong with a guide to the military history of the U.S. Army—but let us not lose sight of the fact that the great bulk of the military history of the world has no direct connection with the U.S. Army. And to the degree that this *Guide* fosters parochialism within the Army, it is to be regretted.

And a second point: of the hundreds (or thousands) of titles listed in the *Guide,* about *ten* are in foreign languages. Now the scholars who have written this *Guide* know well that many of the most important works in military history were written in foreign tongues, and they have not all been translated into English. To the degree that this *Guide* fosters the —disgraceful—ignorance of foreign languages which is so typical of Americans, that too is to be regretted.

In summation then, this book is an excellent reference book and will no doubt come to stand as the cornerstone for the study of military history by Army officers. But it ought to be titled *A Guide to the Study and Use of English-Language Sources on the Military History of the United States Army.* And Army officers

ought to be warned that interservice parochialism and ignorance of foreign languages, foreign cultures, and foreign histories vitiate much of the value of studying history in the first place. Unfortunately, we cannot count on potential foes being as ignorant of our language and history as we are of theirs.

JEFFERY GUNSBURG
Major
Virginia Military Institute

SOVIET MILITARY POWER AND PERFORMANCE by John Erickson and E. J. Feuchtwagner. Shoe String Press, Inc. Jamden, Conn. 219 pages; maps; index. $25.00.

This work is a collection of papers written by a group of military and academic observers of the Soviet Union. The papers were presented at a conference on Soviet capabilities organized jointly by the University of Southampton and the Royal Naval College (Great Britain) in April 1977. Following the conference, the papers, with summaries of the discussion which followed each presentation, were collected to form *Soviet Military Power and Performance.*

By its very origins, the book is diverse. The topics range from a survey of the background of the Soviet Military Establishment through the roles of the Armed Forces in National Integration to a discussion of strategic perspectives. Each chapter provides a general overview of the topic discussion that followed the presentation of the paper. The summary provides an insight into the thoughts and reactions of other conference participants about the material presented.

Several interesting themes emerge from these papers. The first is an analysis of the Soviet attitude toward mutually assured destruction as a means of deterrent and stability in a nuclear world. Several authors suggest that, because of the destruction suffered by the Soviet Union during World War II, the Soviets will never voluntarily accept the possibility of such destruction for any reason. Consequently, while the West may believe that each side can hold the other hostage and thus promote a form of stability, the Soviets will not "trade vulnerabilities as the guarantees of security..." The compliment of this attitude is that "military weight, not measured weakness...pointed the way to safety in an instable world." Therefore, while the West may feel that military deployments which are preceived as reducing its vulnerabilities are disabilizing (because they disrupt the balance of assured destruction), the Soviet Union feels that their forces' purpose is to limit the destruction and regain the offensive. This ability to take the offensive is felt to be the true key to security; and hence forces can never "exceed" those necessary for defense.

Another, more refreshing facet of the book is the optimistic view for western observers of problems in the Soviet Forces. All too often the Soviets' strengths alone are emphasized; Soviet forces are normally portrayed as monolithic, iron-disciplined, thoroughly indoctrinated, and superbly equipped. Instead, the book points out large chinks in this armor. The Soviet soldier "is not only hardy and capable of great selfscrifice but also can be lazy with little sense of urgency and easily depressed by failure." The various national groups that make up the Soviet Union have not been totally assimilated into the Soviet Forces, with the consequent problems of language difficulties, diverse loyalties, and inhibited potentials for advancement. Iron discipline tends to stifle the initiative of leaders; initiative which is vital in modern combat. The Soviets apparently also have much the same problem as western armies with shortages of training aids, training time, personnel, and equipment. All of these problems are enlightening, for it helps to know one's potential adversary is not without his own difficulties.

Overall, the book provides basic information in a straight-forward manner. The text is clear with several maps and figures to amplify points as needed. The depth is sufficient for the casual reader, but would not provide much new information for a serious student. In short, Soviet Military Power and Performance is good supplementary reading, but not a classic.

FRAME J. BOWERS, III
Captain, Armor
USAAEFA

Information concerning the availability of professional books may be obtained from the U.S. Armor Association, P.O. Box 0, Fort Knox, KY 40121.

Recognition Quiz Answers

1. *Indian Vijayanta* (105-mm *L7A1* main gun, produced by India under agreement with Vickers, Ltd, of Great Britian. Engine and main gun same as *Cheftain.* Has .50-cal ranging gun, 7.62-mm coax and antiaircraft machineguns. Fully stabilized)

2. *French AMX-30 Roland* vehicle (has two *Roland* missiles mounted and eight in reserve. Missile has range of 500-6,000 meters. *Roland I* uses clear-weather optical guidance, and *Roland II* uses all-weather radar guidance.)

3. *Swedish Ikv 91* (90-mm low-pressure main gun, equipped with neodymium laser (200-2,000-m) rangefinder electrically linked to analog ballistic computer. Vehicle is amphibious and equipped with 7.62-mm general purpose machinegun.)

4. *French ERC 90 Sagaie* (90-mm gun, fires hollow charge round at 1,000m/sec, and can penetrate 320mm of armor at 0°. Equipped with *TJN 2-90-A* impage-intensifying sight. Export vehicles may be equipped with laser rangefinder.)

5. *Japan Type 73 MICV* (All-welded aluminium hull. Carries 10 infantrymen and crew of 2. Vehicle has two T-shaped firing ports on each side of hull and one in rear ramp. Equipped with caliber .50 bow-mounted and caliber .30 ring-mounted machineguns.

6. *British FV-438 Swingfire* (member of FV-432 family. Has two launcher boxes with a total of 14 missiles carried by vehicle. Engagement range 140-4,000 meters. Vehicle also has 7.62-mm general purpose machinegun.)

(This Recognition Quiz prepared by SFC Chris M. Pruitt, Senior instructor, Master Gunner's Branch, USAARMC)

The price listed for the Crane Russak publication: *Brassey's Tank Warfare,* by Richard Simpkin, in the book review section of the January-February 1980 issue of ARMOR was incorrect. The correct price is $27.50.

☆U.S. Government Printing Office: 1980—657-127/1

THE ARMOR DESK

It went by unnoticed. No celebrations, no proclamations, but the March-April 1980 edition marked ARMOR's 92d Anniversary—the U.S. Army's oldest professional journal.

More than one soldier has commented that much of his success in armor and cavalry was due to the influence of articles printed in the Journal of the U.S. Cavalry Association, The Cavalry Journal, Armored Cavalry Journal, and ARMOR.

The U.S. Cavalry Association, formed in November 1885, was organized for the "professional unity and improvement and advancement of the cavalry service generally." During this same period, the foundations of American military professionalism were laid down.

To achieve the organizational aim of the Association, the Journal of the U.S. Cavalry was first published in March 1888. In its infancy, articles by U.S. Cavalry officers selected for publication were presented to Association members for discussion in the pages of the Journal and at Association meetings.

Even after this editorial practice of commenting on published articles was discontinued, articles in the Journal were reviewed by Association members in lively and detailed letters. Almost the entire cavalry corps participated, because in the early 1900s more than three quarters of all cavalry officers were Association members and received their personal copy of the Journal.

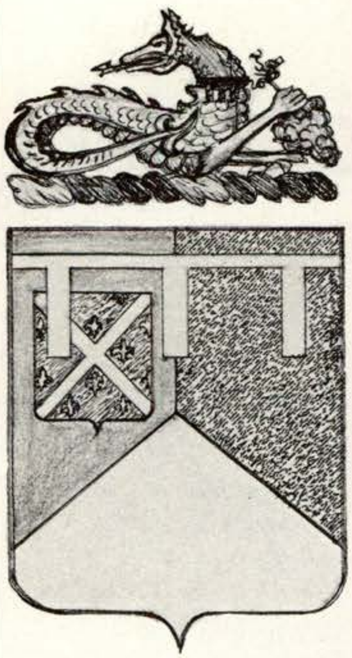
Today, in an armor officer corps, which prides itself in being professional, only 35 percent are Association members. The percentage of noncommissioned officer members is even smaller.

In the next few years, new equipment is going to require changes in tactics, techniques, training, doctrine, organization, etc. ARMOR's goal is to keep you informed of these developments in order to improve your chances of success on the "Integrated Battlefield." For example, during the past several years, ARMOR has carried articles on the XM-1, M-2/3, Soviet Armor, TOW training, M-60A3, and the Command Sergeant Major.

If you are truly a professional "tanker" or "trooper," then you should want your personal copy of ARMOR. You would expect your doctor or lawyer to remain current in his field by reading professional journals. Likewise, the soldiers you lead expect you to keep current in your profession. To do otherwise, is to violate the confidence and trust they have placed in you.

By subscribing to ARMOR, you receive your professional journal and you become a member of your arms' professional organization, the U.S. Armor Association.

FWS



The coat of arms was originally approved for the 15th Tank Battalion, part of which was in the old 304th Tank Brigade. Therefore the shield and crest of the 304th Tank Brigade are used with the label added for difference. The shield is of the colors of the Tank Corps shoulder sleeve insignia. The brigade was organized at Langres, France, in 1918, and the arms of Langres are shown on an inescutcheon differenced by a silver border and changing the cross from red to silver. The wyvern is from the original insignia of the French Tank Corps. The uprooted pine tree commemorates the activities of the brigade in the Argonne forest during the Meuse-Argonne operations.

1st Battalion, 66th Armor

(Iron Knights)

Constituted in February 1918 as Company C, 1st Separate Battalion, Heavy Tank Service, 65th Engineers, and organized at Camp Upton, New York. Redesignated 16 March 1918 as Company C, 1st Heavy Battalion, Tank Service. Redesignated 16 April 1918 as Company C, 41st Heavy Battalion, Tank Corps. Redesignated 25 April 1918 as Company C, 301st Battalion, Tank Corps, American Expeditionary Forces. Reorganized and redesignated 22 June 1921 as Companies A, B, and C, 16th Tank Battalion (hereafter separate lineages; see 2d and 3d Battalions, 66th Armor).

Company A, 16th Tank Battalion, redesignated 1 September 1929 as Company A, 1st Tank Regiment. Converted, reorganized and redesignated 25 October 1932 as Company A, 66th Infantry (Light Tanks). Converted, reorganized and redesignated 15 July 1940 as Company A, 66th Armored Regiment, and element of the 2d Armored Division. Transferred in June 1944 from 1st Battalion to 2d Battalion, 66th Armored Regiment.

Redesignated 25 March 1946 as Company A, 66th Tank Battalion, and remained assigned to 2d Armored Division. Redesignated 5 January 1949 as Company A, 66th Medium Tank Battalion. Redesignated 1 April 1953 as Company A, 66th Tank Battalion.

Reorganized and redesignated 1 July 1957 as Headquarters and Headquarters Company, 1st Medium Tank Battalion (Patton), 66th Armor, and assigned to 2d Armored Division (organic elements concurrently constituted and activated). Reorganized and redesignated 1 July 1963 as 1st Battalion, 66th Armor.

Campaign Participation Credit

World War I
*Somme Offensive
St. Mihiel
Meuse-Argonne

World War II
Algeria-French Morocco
(with arrowhead)
*Sicily
*Normandy
*Northern France
*Rhineland
*Ardennes-Alsace
*Central Europe

Korean War
UN defensive
UN offensive
CCF intervention
First UN counteroffensive
CCF spring offensive
UN summer-fall offensive
Second Korean winter
Korea, summer 1953

Decorations

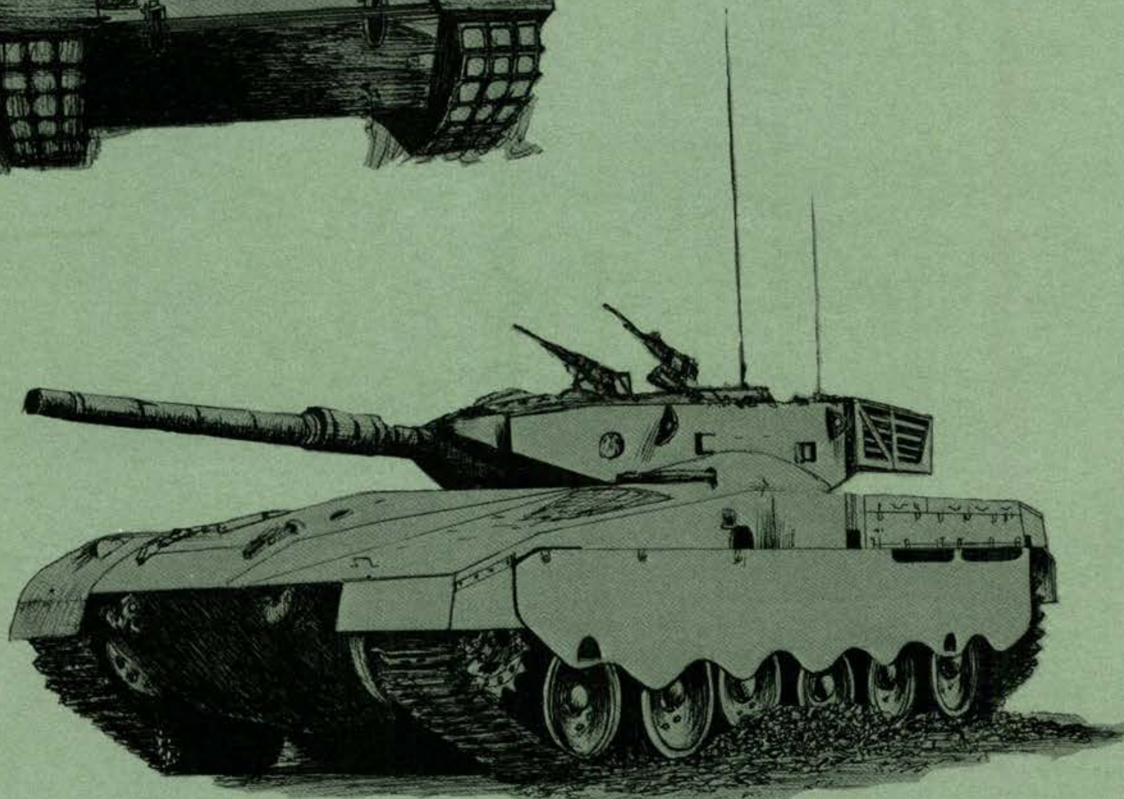
*Presidential Unit Citation (Army), Streamer embroidered PIVITSHEIDE
*Presidential Unit Citation (Army), Streamer embroidered NORMANDY
Presidential Unit Citation (Army), Streamer embroidered VIRE RIVER
Presidential Unit Citation (Army), Streamer embroidered ROER RIVER
*French Croix de Guerre with Palm, World War II, Streamer embroidered ST. LO
*Belgian Fourragere 1940
*Cited in the Order of the Day of the Belgian Army for action in BELGIUM
*Cited in the Order of the Day of the Belgian Army for action in the ARDENNES

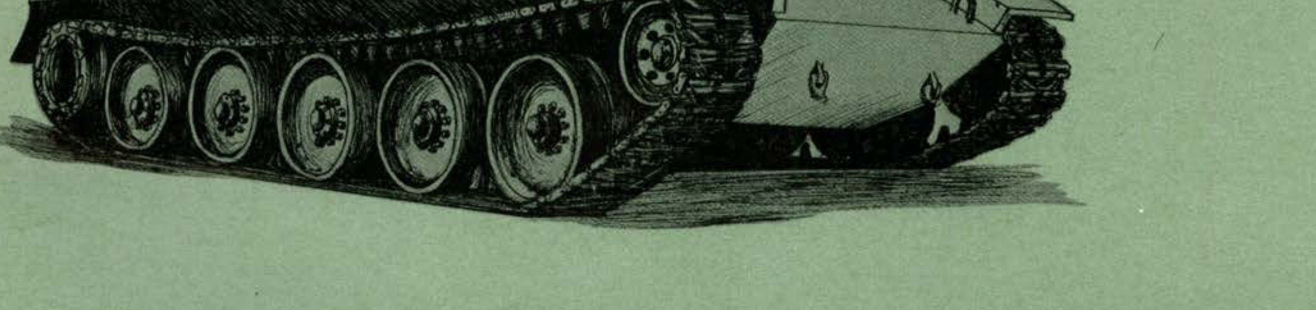
Asterisks (*) appearing in the lists of honors for units under the Combat Arms Regimental System (CARS) indicate the honors for which a particular unit is the earning unit. This means that either the unit itself, or a unit from which it has directly descended, earned the honor. Campaigns and decorations for each battalion and squadron under CARS include all honors of the parent regiment.

This is the first in a series of unit histories that will appear in ARMOR.

july-august 1980

ARMOR





US ARMY
ARMOR CENTER and FORT KNOX

Commanding General
MG LOUIS C. WAGNER, JR.

Deputy Commanding General
BG JOHN L. BALLANTYNE

Chief of Staff
COL WILLIAM F. COAD

Command Sergeant Major
CSM JOHN W. GILLIS

Deputy for School Activities
COL ROBERT A. PLANT

Deputy for Educational Technology
DR. CHARLES W. JACKSON

Director, Office of Armor Force Management
COL MOWTON L. WARING, JR.

INSTRUCTIONAL DEPARTMENTS

Maintenance
LTC MARTIN L. PLASSMEYR

Command and Staff
LTC WILLIAM R. WILSON

Weapons
COL DONALD L. SMART

Committee Group (BT)
COL CHARLES D. McGAW

NCO Academy/ Drill Sergeant School
CSM BENJAMIN E. PEACHER

DIRECTORATES

Combat Development
COL JIMMY L. PIGG

Training Developments
COL GARY W. BLOEDORN

Armor Doctrine
COL JOHN H. KIRKWOOD

Armor Aviation
COL ROBERT A. HEFFORD

UNITS

The Lightning Brigade
COL ROY C. PRICE, SR.

1st AIT/OSUT Brigade (Armor)
COL ANDREW P. O'MEARA, JR.

4th Training Brigade
COL ERNEST D. JOHNSON

"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare; to promote professional improvement of the Armor Community; and to preserve and foster the spirit, the traditions, and the solidarity of Armor in the Army of the United States."

JULY-AUGUST
Vol. LXXXIX, No. 4

ARMOR the Magazine of Mobile Warfare

Editor-in-Chief
LTC FREDERICK W. SHIRLEY

Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
JEANNIE BRIGHT

ARMOR Magazine is published bimonthly by the U.S. Army Armor Center and Fort Knox at 4401 Vine Grove Road, Fort Knox, Kentucky 40121, to stimulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters. Unless otherwise stated, material does not represent official policy, thinking, or endorsement by any agency of the U.S. Army. Use of funds for the printing of this publication have been approved by the Department of the Army, 23 February 1979.

SUBSCRIPTION RATES: Individual subscriptions to **ARMOR** are available through the U.S. Armor Association, Post Office Box O, Fort Knox, Kentucky 40121. **Domestic:** $8.00 one year, $15.00 two years, $22.00 three years. **Foreign:** $10.00 one year, $18.00 two years, $26.00 three years. Single copies, $1.50.

CORRESPONDENCE: Address all correspondence to U.S. Army Armor Center and Fort Knox, ATTN: ATZK-MAG, Fort Knox, Kentucky 40121. (Telephone: AUTOVON 464-2249 or commercial (502) 624-2249.)

POSTMASTER: Controlled circulation postage paid at Indianapolis, Indiana, Department of the Army, DOD 314.

ARMOR may be forwarded to military personnel whose change of address is caused by official orders (except to APO addresses) without payment of additional postage. The subscriber must notify the postmaster.
USPS 464-510

COVER

Richard M. Ogorkiewicz marks the 30th anniversary of his first article in **ARMOR** with a review of recent advances in tank technology. He discusses new types of armor protection, improvements in automotive components and main armament, and changes in tank configuration. Pictured on the cover are, top to bottom, the Indian *Vijayanta*, the latest version of the Israeli *Merkava*, and the Japanese *Type 74*.

LETTERS

Fire Support

Dear Sir:

The two most conspicuous elements of combat power used by a combined arms team are *maneuver* and *fire support.*

Maneuver elements may include armor, infantry, mechanized infantry, airlifted, and attack helicopter units together with their organic personnel and equipment.

Fire support weapons for the team may include mortars, field artillery, close air support (CAS) and naval gunfire (NGF), when available. For some operations, a division commander may supplement his conventional fire support means with other weapon systems. This could include air defense weapons firing indirect fires against surface targets. It might include attack helicopters, if they are not being used in their maneuver role. The force commander uses what's available to get the job done.

In developing Army literature today, there is a tendency on the part of some authors to consider *fire support* as synonomous with only *field artillery* fires. Mortar fires are sometimes treated as non-fire support means while CAS is discussed under the "air land battle" rather than under fire support. Attack helicopter fires are seen as "maneuver" and exclusive of fire support.

This fragmentation of fire support into several areas is contrary to good team practices. All successful football teams may drill their backs, ends, and linemen separately but do bring them together as a team before a game. The same need exists for fire support.

The tendency to fragment fire support is strange, especially in view of the Army's recent acceptance and implementation of the Fire Support Team (FIST) concept wherein mortar and field artillery observers are combined under the new enlisted MOS 13F. FISTs with companies (troops) are supervised by fire support officers (FSOs) operating at maneuver battalions and brigades. Lieutenants, serving as FIST Chiefs, are trained to direct close air support aircraft if an air force forward air controller (FAC) is not available. The tendency to treat CAS separate from fire support is faulty when one considers how often air vehicles will have need for an outside fire support means to suppress enemy air defenses (SEAD) while they operate in the face of hostile air defenses.

A common misconception of fire support which often fosters fragmentation of fire support efforts is that it reacts to someone other than the supported maneuver commander. This is not true. While field artillerymen do serve as fire support coordinators (FSCOORDs) at all maneuver levels, company and higher, they do so under the guidance and priorities established by the supported commander. For example, an FA battalion in direct support (DS) of a brigade provides full-time FSCOORDs throughout the brigade. They insure that the total fire support effort is responsive, effective, safe, and within the priorities set by the maneuver force commander. If fire support is denied, changed, or substituted for, it's usually because a maneuver commander so desired—not because a FSCOORD overruled. Fire support functions for the supported commander.

If Army fire support is to be truly responsive and effective, it should not be fragmented with each fragment managed independently. It must be collectivized into a single team effort and under one manager. A support manuever commander (or his operations officer) must speak to *all* his fire support through one individual—his fire support coordinator.

CHARLES W. MONTGOMERY
Lieutenant Colonel (Retired)
Lawton, OK

"Make Haste Slowly"

Dear Sir:

We read with avid interest your recent article on battle simulations entitled "Games Soldiers Play." By sharing his instructive thoughts, Major Probsdorfer provided a valuable update on the implementation of two games by the field Army. In his closing comments on "future implications," he reminds us that technology is advancing rapidly in sophistication, reliability, and adaptability. While we agree that the state-of-the-art moves on, we are concerned about replacing the "roll-of-the-die" technique used in *Dunn-Kempf* with a computer. As we stated in our article "Terrain Boards as Tactical Instructional Aids" in the October 1975 issue of *Military Review:*

> "We have no desire to minimize the contribution the computer has made to our commander and staff training efforts. Rather, we hope to justify the premise that the combination of an inexpensive terrain board and miniature models deserves a complementary place in our units and institutions. Over-reliance on complex computer methods of gaming by the military community has resulted from an uncritical audience."

Both of us have had recent experiences in applying *Dunn-Kempf* (V Corps in Europe, I Corps in Korea, and teaching cadets at the US Military Academy). These experiences have fortified our resolve that the manual techniques still have distinct time and learning advantages over the current array of calculators/computers when playing at the company team, platoon, or section level (we don't question their necessity at Brigade level or higher). Specifically, we found that:

- Use of computers is more time-consuming than the dice methodology. The key is not the time required for calculations, but the time required to format input and type data for each engagement into the computer and wait for output printing or display.
- The *Dunn-Kempf* wargame forces the player to consider vehicle capabilities, terrain, weapon characteristics, and tactical engagement factors and to understand how they all interact to influence the outcome of engagements. The continual forced consideration of these factors and the "trade-offs" that produce the best tactical results cause the player to internalize tactical decision-making skills. A player can readily identify what went wrong when he loses a vehicle to enemy fire.
- The primary consideration of the *Dunn-Kempf* wargame is the target audience and maintaining their interest so that the instructional material can be "discovered," used, refined, and internalized. This requires participation in successive engagements. Having a computer display the outcome of discrete engagements could cause player reluctance to accept the results because the players will not see how the tactical factors interacted to produce the results. The instructional value of identifying the critical tactical factors in the engagement will be lost. If the players do not readily accept the combat results, their interest will lag and the value of the simulation will be lost.

We trust these thoughts will help in making the transition of technology to small-unit level gaming a cautious process. Since player interest and learning

are the principal values stressed in the *Dunn-Kempf* version as originally developed, we must be careful not to lose too much in attempts to gain greater accuracy and perhaps speed with computer devices.

C. HILTON DUNN, JR.
Major, US Army

STEPHEN J. KEMPF
Major, US Army

So Much with So Little

Dear Sir:

In regards to Captain Conn's letter, ***ARMOR,*** January-February, I most heartily agree, all armor soldiers should benefit from exactly this type of training. Unfortunately, as always seemsto be the case, ammo, fuel, etc., is in short supply. Our ammo forecasts drop all the time, even for blank small arms and pyrotechnics.

Colonel Borgman's article "Money in the Trenches," leaves me with the thought that we'll have to do more with less for as long as anyone can foresee. The Defense Budget has a lot of money for R&D on fancy gadgets, sophisticated systems, *F-16* planes, cruise missiles, etc. But when it comes to the guts and heart of the armed forces, the men, there is not enough left. Tank crewmen don't have a functional uniform. They don't have enough ammo. There's talk now about camouflage uniforms for everyone. It's a good idea, seeing how every other army in the world has had camouflage for their troops across the board for years. We will probably camouflage in about 2 years. They have to develop and test and research it first. I guess as the old saying goes, we have been doing so much for so long with so little that now we can do everything with nothing forever.

MICHAEL D. DALY
Staff Sergeant
WisARNG

Flaws in Book

Dear Sir:

I read with interest the review of Richard Simpkin's book *Tank Warfare: An Analysis of Soviet and NATO Tank Philosophy,* by Joseph E. Backofen, Jr., in the January-February 1980 issue of ***ARMOR*** Magazine.

While I cannot disagree with any of the comments made by Mr. Backofen, I feel that there are some important flaws in Brigadier Simpkin's book concerning the history of western tank development. The most important is the discussion on the development of improved, armor-piercing projectiles. Simpkin confused the German development of *Arrowhead* shells, which were tungsten-cored composite antitank projectiles with the German *Peenemunde Arrow* shell which was a 310-mm smoothbore, high-explosive projectile fired from a converted 280-mm railway gun. While this could be deemed a minor point, the Russian *BM-6* armor-piercing projectile for the 115-mm smoothbore gun in the *T-62* is obviously a design descendant of the *Peenemunde Arrow* shell. The projectile layout, length-to-diameter relationship, and sabot design resemble each other to a very high degree. Brigadier Simpkin simply failed to do his homework on the date of introduction of the armor-piercing, discarding-sabot (APDS) projectile. It was developed and issued for use in 1944 for the 6-pounder antitank gun and 17-pounder tank/antitank gun in British service. Granted there were accuracy problems at long range, but several British authors have discussed the APDS development in some detail.

The final major error is the failure to identify the *T-64* tank as a major new design, owing little to any previous Soviet tank in design detail. The *T-64* and *T-72* are two separate tanks, although they share many design features. While I believe that these minor flaws detract from the book, *Tank Warfare* deserves to be treated as a companion volume to Ogorkiewicz's masterful *Design and Development of Fighting Vehicles.*

Particularly refreshing and noteworthy are the kindest words about the *M-60* series I can recall by a European writer. Brigadier Simpkin neatly makes the point that the *M-60A1* is the most balanced tank design in NATO. The necessity to produce a tank suitable for operations anywhere in the world is not appreciated by most European commentators.

I hope the Armor Association or the Armor Book Store will pick this book for stockage and sale to the Armor Community.

GERALD A. HALBERT
Captain, Military Intelligence

Tank Warfare can be ordered through the U.S. Armor Association, P.O. Box O, Fort Knox, KY 40121 for $27.50 plus postage. Ed.

Poor History

Dear Sir:

General Bruce Clarke's story about General Devers ("Letters" March-April 1980) made amusing reading, but it contained some poor history. The *M-4* tank did not result from the assembling by General Devers of the heads of General Motors, Ford, and Chrysler in his hotel room and his demand that they pool their efforts to produce such a tank for WWII.

At the time General Devers assumed command of the Armored Force, the pilot vehicle (*T-6* medium tank) at APG was almost ready to run. It was demonstrated to him on September 2, 1941. I was near enough to him at that time to hear his enthusiastic demand for a thousand by the end of the year, provided the side doors were removed and his impatience when he was told the facts of life about industrial production.

The *T-6* was standardized as the *M-4* a few days later, but the first production vehicles did not come off the line at Lima Locomotive until February 1942. Pressed Steel Car was next in March. Ford followed in May. By 1943, Pacific Car and Foundry, Montreal Locomotive, Baldwin Locomotive, American Locomotive, Pullman Standard, Federal Machine and Welder, and GM's Fisher Tank Arsenal had been added. It was not until April 1943 that Chrysler's Detroit Tank Arsenal went into production on the *M-4.*

ROBERT J. ICKS
COL AUS (Ret)

Disputes Claim

Dear Sir:

During the past year, I noted with dismay your magazine's continued use as a propaganda vehicle for claims by Company H, 2d Squadron, 6th Cavalry, of being the Army's first *XM-1* tank company. You may derive some mental comfort from the fact that other so-called professional publications are equally guilty, but such a rationalization will not serve to hide your gross violations of the principles of sound journalism and the trust placed in you as editor-in-chief.

If one of the purposes of your magazine is indeed "to preserve and foster the spirit, the traditions, and the solidarity of Armor in the U.S. Army (a quote from the inside of the front cover of **ARMOR** Magazine), I would suggest you refrain from publication of such claims by Company H, 6th Cavalry. That unit cannot claim to be the Army's first *XM-1* tank company. Their efforts in testing the *XM-1* were truly of great importance to the Army and the National Defense, and they have a right to be proud, but their accomplishments in terms of time, effort, rounds fired, miles driven, etc. are dwarfed by the accomplishments of those who completed the *XM-1* OT II.

On behalf of the officers and men of Company H, 2d Squadron, 3d U.S. Cavalry, "BRAVE RIFLES. . . ."

JOHN N. SLOAN
Lieutenant Colonel, Armor
Commander, 2/3 ACR

Co H, 2/6 Cav's claim of being the first XM-1 Company is based on the fact that it is the first tank company equipped only with XM-1s. When Co H, 2/3 Cav tested the XM-1, the Company still retained its M-60s. Out of respect for the "tropper," ***ARMOR*** *will refrain from claiming any company was "first." Ed.*

Effective Use of Electronic Warfare

Dear Sir:

Colonel Robert E. Wagner's article, "Covering Force Operations," (***ARMOR,*** March-April 1980) contained some information which left some false impressions as to the effectiveness and utilization of electronic and signal intelligence on the battlefield. These impressions could be detrimental to commanders at all levels and to their troops.

Colonel Wagner stated that the 2d Armored Cavalry Regiment (ACR) successfully covered a 90-kilometer sector for over 2 days and nights against the attack of a reinforced armor division. In fact, 48 hours after Exercise CERTAIN SENTINEL kicked off, the 1st Armored Division (Orange Forces) captured the tactical operations center (TOC) of the 1st Infantry Division, which along with the 2d ACR, constituted the Blue Forces. The war was over. The 1st Infantry Division TOC was located by signals intelligence elements of the Orange Forces and lanced twice.

Later in his article, Colonel Wagner implies that the effectiveness of electronic intelligence (ELINT) and signal intelligence (SIGINT) was nil. He stated that, in one instance, the enemy moved a brigade 20 kilometers laterally, crossed a river, and attacked without being detected by corps collection assets. This is true, but apparently the wrong lesson was learned.

During the exercise, Orange and Blue Forces were allocated electronic warfare assets in as equitable a manner as was possible. The scenario called for certain corps and army intelligence collection assets to be dedicated for predetermined periods of time; first to the Orange Forces, then to the Blue Forces. This was necessary because there is currently a shortage of some of the more sophistacted collection systems in Europe. During the time when the 1st Armored Division moved a brigade, undetected, these systems (i.e., *Guardrail* and *Quicklook*) were probably in support of the Orange Forces.

Now, I would like to address the "real reason" why Colonel Wagner felt electronic warfare collection elements attached to the Blue Forces were ineffective. The key is electronic counter countermeasures (ECCM). During the 5-day period preceding the start of CERTAIN SENTINEL, when both the Blue and Orange Forces were in the field and lining up, the Orange Forces maintained complete radio silence. The Blue Forces did not. This completely negated any effectiveness on the part of the Blue Forces ELINT and SIGINT assets. This is a lesson that should have been learned.

If one will read the electronic warfare (EW) annex to the 1st Armored Division's operations order for CERTAIN SENTINEL and the after action reports from that exercise, it will become evident that Major General Glenn Otis, 1st Armored Division Commander, effectively deployed and utilized his EW assets. His employment of electronic counter measures (ECM) assets were superb. By massing all ECM assets in one brigade sector and denying the Blue Forces use of communications in that sector, Major General Otis moved one of his brigades 20 kilometers laterally and attacked across the Main River undetected. The success of the Orange Forces during CERTAIN SENTINEL was due in large part to the proper planning and utilization of the division's intelligence-gathering assets.

Commanders at all levels should learn as much as possible about ELW on the battlefield. It should be as effective as any other type of firepower.

During CERTAIN SENTINEL, I was first sergeant, 202d ASA Company, 1st Armored Division. I saw first hand the effectiveness of electronic warfare. I also saw the importance of using proper ECCM techniques.

Anyone having apprehensions as to the usefulness of EW should talk to Lieutenant General Otis, DSCOPS, U.S. Army. He is an expert in this field and a brilliant tactician and strategist.

ROBERT H. SMITH
Sergeant First Class
Goodfellow Air Force Base, TX

The South Defended

Dear Sir:

I recently read Major Edgar Smith's article "Morale: An Invisible Weapon" (***ARMOR,*** March-April 1980). Generally, his points are well taken.

Unfortunately, his description of Confederate morale in the U.S. Civil War sounds more like Yankee propaganda in 1864 than objective history in 1980.

At best, his portrayal of crumbling Confederate morale is exaggerated and unbalanced. It makes too much of the slavery issue, underestimating the role of regional patriotism in motivating the average Confederate—not to mention the anger aroused by the Union's scorched earth strategy, which was viewed with real horror and disgust in that age.

Above all, Major Smith ignores the bottom line—Confederate performance. One can only wonder how soldiers as broken in spirit as he describes could have bloodied the North's overwhelming forces so badly and resisted them so stoutly for 4 years, while suffering shortages of almost everything from arms to shoes.

Were Lee's veterans demoralized in the Appomattox campaign? Reduced to about 10,000 hungry souls, on the verge of defeat, surrounded by 100,000 enemy troops, they nonetheless inflicted 10,000 Union casualties in the last 10 days and were still attacking (and pushing back) Union forces in some sectors when Lee asked for surrender talks.

Demoralized? We can only pray that the U.S. will be blessed with such "demoralized" troops in any future war.

HARRY F. NOYES, III
Westland, MI

Ammunition Resupply

Dear Sir:

"Ammunition Resupply," by CPT Thomas G. Pratuch, exposes the reocurring difficulty armor units have in resupplying ammunition in wartime. My unit has tried boxes of rocks in assorted sizes, yellow slips, and time delays to simulate ammunition resupply but even these methods combined are quite inaccurate. Ammunition resupply is a very serious challenge.

The author should refer to the operator's manual for the 2½-ton truck. The cross-country load capacity for the *M-35* cargo vehicle is 5,000 lbs, not 6,000 lbs.

A author's second error was one of omission. Why do support platoon leaders fail to use all of their cargo-hauling assets? Every 2½- and 5-ton truck in the support platoon has a 1½-ton trailor that will increase the cargo hauling capability significantly. Seven 1½-ton trailers with a 3,000 lbs cross-country capability will add 21,000 lbs additional hauling capability of the section. His truck haul capacity total is 146,000 lbs with trailers and 125,000 lbs without. The support platoon leader cannot let his additional hauling capability sit in his motor pool when the unit moves to deploy as it often does during ARTEPS.

MATTHEW G. HYDE
First Lieutenant, Armor
Wild Flecken, FRG

Needs Photos

Dear Sir:

At the present time I am working on a photo book dealing with all the armored vehicles used in the Indochina and Vietnam wars. I would like to make contact with anyone who has photos or information dealing with armor and/or armor units as used there. Anyone wishing to help out in this project should contact me at the following address:

JIM MESKO
4019 LeCona Road
Akron, Ohio 44319

THE COMMANDER'S HATCH

MG Louis C. Wagner, Jr.
Commanding General
U.S. Army Armor Center
and Fort Knox

I assumed command of the U.S. Army Armor Center and Fort Knox on 6 June 1980. I last served here as an Armored Cavalry Troop Commander and student in the advanced course; therefore, I am currently involved in being brought up to date on the full range of activities at Fort Knox. My initial impression of the Armor Center is extremely positive, and I look forward to the many challenges this exciting command offers.

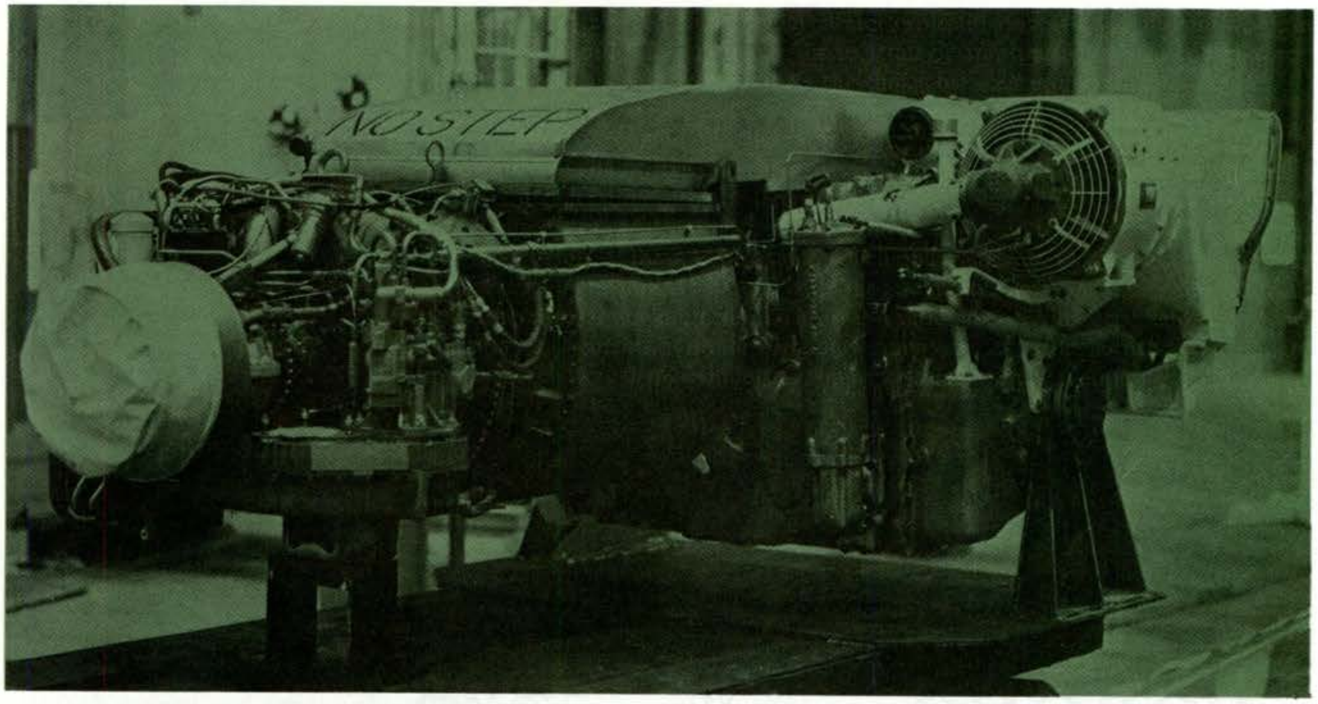
During my time here, Fort Knox will continue to be the Home of Armor, with all that that connotes. We will develop training techniques and systems, and mobile warfare doctrine, and we will assist materiel developers in developing the most combat effective weapon systems, just as we have in the past. I hasten to add, however, that the Armor Center has no monoply on expertise in this arena. It will work closely on a daily basis with all other Training and Doctrine Command Centers and major commands worldwide to assure that all doctrine, training techniques, and other guidance promulgated by the Armor Center represent the best thoughts available. It is particularly important that all proponents of mobile warfare pull together and share our expertise with each other. There is no place in today's Army for the "not invented here" syndrome. To that end, I will shortly be communicating with Armor and other mobile warfare leaders worldwide to encourage more open communication among us all to assure that good ideas, no matter what the source, are made available to other units. I will also visit units throughout the world to see firsthand the innovative techniques you have developed in all areas. This is particularly important in a time when limited resources are available to ensure the Army is ready to fight worldwide with little or no advanced notice.

The decade of the 1980's will be the most dynamic faced by the Army since World War II. We are just beginning an equipment modernization program unparalleled since that time, which includes not only the *Abrams* tank, *M-2* infantry fighting vehicle, *M-3* cavalry fighting vehicle and advanced attack helicopter, but also a myriad of systems to support all functions of the Army. While this equipment will be the finest in the world, it is only as good as the soldier who operates it. Integrated circuits and digital computers don't think! They are simply tools in the hands of skilled operators. The Armor Center is dedicated to providing the best trained officers and enlisted soldiers in the world to man this new equipment. We will use the most modern training technology, plus tried and proven techniques, to meet this goal. "The Combat Arm of Decision" will continue during the 1980's to provide the Combined Arms Team—both on the ground and in the air—its firepower, mobility, and awesome shock effect just as it has during its illustrious past.

The Armor Center has been deeply involved in working with all members of the Combined Arms Team to ensure that doctrine that has been developed represents the best utilization of all arms to maintain that edge in battle essential to victory. There is no place for the "loner" on today's complex and lethal battlefield. Just as important has been the effort to develop the combat service support capability to keep the combined arms team operational. I recognize that one of my most important missions is to continue this effort with all stops pulled. The Armor Center and I are determined that all aspects of mobile warfare, including all types of Armor units—ground, air cavalry, and attack helicopter—are fully integrated into the Combined Arms Team.

I am looking forward to hearing from all members of the Armor team.

Forge the Thunderbolt!



The U.S. Army's new ***XM-1*** main battle tank is now in production at the Lima, OH Tank Plant. It is powered by an Avco Lycoming ***AGT-1500*** gas turbine engine (top photo).

Trends In Tank Technology

by Richard M. Ogorkiewicz

This is the 69th article by the author to be published in ***ARMOR*** *during the past 30 years. The editor, in behalf of the staff and former editors and staff, extends sincere thanks to Mr. Ogorkiewicz for his dedicated support through the years.*

Tank technology has made considerable progress in recent years and it continues to advance. As a result, the shape of tanks is changing and is likely to change even more in the years to come.

The overall effect of this should be to enhance the position of tanks as a basic item of army equipment. This means equipment that is applicable and effective across the whole spectrum of ground operations and not merely in a few limited offensive roles, to which some people would still confine tanks.

What makes tanks of such general and lasting importance is, of course, ability to make the heavy, direct-fire weapons mounted in them more mobile and, therefore, more effective. The ability of tanks to do this involves two things. One is clearly their automotive performance and especially their ability to move cross-country. The other and less obvious aspect of the mobility of tanks is their armor protection, which enables them to move more freely on the battlefield than unarmored vehicles.

Unfortunately, the two aspects of the mobility of tanks involve features which are in conflict with each other. In particular, armor protection involves weight, and weight is not conducive either to automotive or to strategic transportability. In consequence, there has been much controversy over the choice between protection and weight.

Heavier Armor Protection

The conflict of opinion over the protection and weight of tanks was particularly intense during the mid-fifties and early sixties when the decisions were made which led to the current generation of battle tanks.

One extreme of the decisions reached at the time was represented by the adoption by the French Army of the *AMX-30* tank, which only weighs 36 metric tons.[1] In adopting it, the French Army opted for mobility in the automotive sense and accepted a relatively modest level of armor protection. This was a rational decision in the light of the contemporary assessments of armor-piercing weapons and in particular of antitank guided missiles which were then beginning to come into service. In fact, antitank weapons were

considered to be so effective at the time that no practicable amount of armor was thought capable of protecting tanks from them.

However, the Arab-Israeli War of 1967 demonstrated that heavy, conventional armor was still worth having, especially in tank versus tank battles.

At the same time, the difference in weight between the most and least heavily armored tanks did not prove as great a disadvantage as was feared. In other words, the lighter weight of the less heavily armored tanks did not make them significantly more mobile—at any rate in Central Europe and in the Middle East.

As a result, the balance began to swing in favor of heavy armor. To be true, tanks of less than 40 metric tons continued to be produced. They included not only the French *AMX-30* but also the Swiss *Pz. 68,* the Indian *Vijayanta,* and the Japanese *Type 74.* Moreover, an even lighter weight tank, the 30-metric-ton *TAM,* is now being produced in West Germany—but only to meet the special requirements of Argentina.

Other tanks produced in West Germany have been provided with heavier armor and their weight has grown accordingly. Thus, the original version of *Leopard 1* weighed 40 metric tons but improved armor increased its weight to 42 tons in the final version. The *Leopard 2* became considerably heavier still. In fact, its current production version weighs 55 tons. This makes it as heavy as the British *Chieftain,* which until recently was the most heavily armored battle tank in service and which the German Army regarded in the past as too heavy.

Another manifestation of the changing attitudes towards armor protection is the difference between the requirements for the *MBT-70* and the *XM-1.* The former, written in 1963, accorded priority to mobility over armor protection. In contrast, the requirements for the *XM-1,* laid down by the U.S. Army in 1972, rated survivability above mobility and led to a tank which weighs 54.8 metric tons.

New Types of Armor

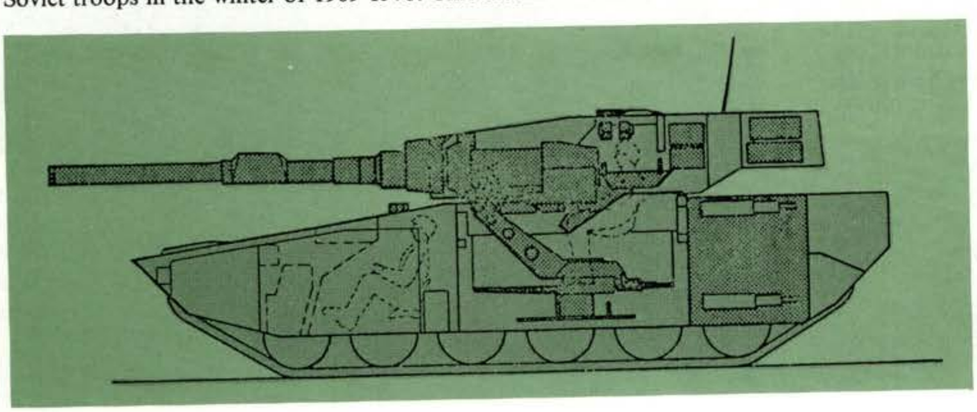
Changes in favor of heavier protection have been accompanied by the development of new and much more effective types of armor. The most remarkable of these is the composite or "special" armor, which is also called Chobham armor after the location of the British Military Vehicles and Engineering Establishment where it was first successfully developed. Details of this type of armor remain a secret but there is no secret of the fact that it can be two to three times as effective against shaped charges as steel armor of the same weight.

Such a dramatic improvement in the effectiveness of armor protection has created an obvious opportunity for reducing the vulnerability of tanks to shaped charges which are the basis of the great majority of antitank weapons.

For instance, a tank no heavier than the 36-ton Soviet *T-55* could be protected over its front from the common types of infantry antitank guided missiles with warheads of about 100-mm if it were built with composite armor instead of the traditional homogeneous steel armor, which it has. Heavier tanks with more armor can obviously be protected against even larger missiles.

In view of this, heavy composite armor was bound to be incorporated in new tank designs, in spite of the weight penalty which it imposes. The resulting tanks are exemplified by the US *XM-1,* the German *Leopard 2* and a development of the British *Chieftain* designated *FV 4030.*

So far, no Soviet tank has appeared with composite armor. However, the Soviet Army is slow to reveal its new tanks. For instance, the latest *T-72* tank was first paraded in Moscow in November 1977 but an early version of it was already in the hands of the Soviet troops in the winter of 1969-1970. This means that the T-72 was designed much



Cross section of the battle tank designed by Contraves for the Swiss Army.

earlier than the latest Western tanks with composite armor and is not, therefore, comparable with them.

In all probability, the basic design of the *T-72* dates from the early sixties, and it is interesting to note that its general characteristics correspond in many ways to what was being considered at the time in the United States—that is, just prior to the commencement of the abortive *MBT-70* program. Since the *T-72* was designed, the Russians are bound to have worked on composite armor and it is more likely that they have a new tank incorporating it. In fact, the existence of such a tank, called the *T-80,* is now widely accepted and has been given, among others, as the reason for the increase in the warhead of the new *Hellfire* antitank guided missile from 152- to 178-mm.

The size of the *Hellfire* warhead provides, indirectly, a further indication of the effectiveness of composite armor. Composite armor is not, of course, a solution to all problems. In particular, it does not make tanks invulnerable to all forms of attack, which no armor ever will. But it does offer tanks important advantages. In particular, it offers them greater freedom of movement in face of many more weapons and, ultimately, greater survivability.

Mobility and Agility

Other attempts at increasing the survivability of tanks have been less fruitful so far. The most important of them amounts to making tanks more mobile and more agile. The idea behind this has been that by making them faster and more maneuverable tanks will be more difficult to hit and therefore, more likely to survive under fire.

To make tanks faster and more agile requires, in the first instance, higher power-to-weight ratios. At present, tanks such as the British *Chieftain* and the Soviet *T-62* only have 13 to 15 hp per metric ton. But the 1958 Franco-German requirements, which led to the *AMX-30* and the *Leopard 1,* already called for 30 hp per ton. As it happens, neither of the two tanks achieved more than 21 hp per ton but the *MBT-70* attained 30 hp per ton and this has now been closely approached by the *XM-1* and the *Leopard 2.*

In the meantime, still higher power-to-weight ratios began to be considered. In par-

some of the preceding ones, we shall

work at this stage would be to place such

bitant.

By this point the soldiers reading this

they have enormous flexibility in their arc of employment.

It follows that, if we are to exploit all these characteristics to best advantage, we should in principle rely on the Army's integral weapons for the contact battle and task the ground attack aircraft against battlefield targets beyond the FEBA which the Army cannot so easily deal with itself.

A number of advantages now accrue to us. First, we can wreak more havoc among the enemy's interior formations. The contact battle depends entirely on the lifelines which support it from the rear. The enemy cannot be allowed to operate these lifelines with impunity. Anything that can be done to impede and disrupt them will weaken the enemy's strength in the frontline just as surely as attacks directed against the frontline itself—just as surely, but more efficiently. Targets in this area could include road and rail movement, river crossings, vehicle parks, headquarters, signal units, assembly areas, forward administrative areas, POL, ammunition storage, and so on. These are not necessarily "second-echelon" units. They may well be components of leading divisions which, however, are not themselves in the frontline.

There is no problem now of disentangling the enemy's troops from our own; out here everything beneath is fair game. Although these targets could range up to 100 kilometers behind the front line (less than 8 minutes' flying time), the majority will be much closer. And it is important to stress that target priorities must still be decided by the ground commander.

Our attacks will now have a twofold effect: first, in addition to destroying enemy targets we force the enemy to use concealment and dispersion and a degree of circumspection that will harass and slow him down in areas where his needs rely heavily on freedom of movement.

Second, by increasing the area over which we operate we force the enemy to spread his air defenses, thereby complicating command and control, reducing intensity, and reducing our vulnerability. There is an inverse square law in effect here, and the greater the area over which we range the more this dispersion works in our favor. True, our aircraft must still cross the frontline, but they need not do so at points of known enemy concentration.

Furthermore, as long as we were doing the traditional close air support, the enemy knew where to mass his defenses to best advantage. Without the certainty of direct close air support he no longer knows where they should be sited. In the event, many will be in the wrong places and, in a continuous attempt to rectify this, a portion will always be on the move. Those left at the frontline will probably take a greater toll of their own aircraft than of ours.

This brings us to a final and very significant point. If our aircraft are usually not operating over our own forward troops, the Army's surface-to-air defenses could often be given virtually carte blanche rules of engagement. Imagine the vast increase in their effectiveness if, for most of the time, they were free to fire at nearly every fixed-wing aircraft making attacks in their sector.

Remember that the enemy's attempts at close air support will be dogged by the same inefficiencies as would have affected our own; perhaps more so because our own troops, being in the defense, will have the benefit of better concealment. The exchange rate would swing hard in our favor, and with the accuracy of today's air defense weapons, enemy losses could be devastating.

There is one important caveat. The above considerations will apply as a general rule to the tactic of close air support. We must recognize though that there will be exceptions, situations where the use of ground attack aircraft in direct close support may be vital. Such situations might be, for example, an enemy breakthrough in a weakly defended front, or the support of particular ground units which for one reason or another are lacking their own combat support firepower. And we have left out of the account some other special situations, of which Vietnam provided many examples. But it would be wrong to treat these cases as standard, and to build our close air support doctrines exclusively around them.

In calling into question our traditional ideas about close air support, it has not been the purpose of this article to suggest that such support could be dispensed with. On the contrary, we need to give more air support to the land battle, not less. And we could do this, even within the level of current resources, by employing these resources in different ways. But we shall not reorient our resources until we can reorient our tactics; and tactics are a matter of ideas. So this is where the process must start: with a thorough overhaul of our ideas as to the true nature of close air support.

GROUP CAPTAIN IAN MADELIN is the British Royal Air Force (RAF) Advisor to the Commander, Air University, Maxwell Air Force Base. A graduate of the RAF College of Air Warfare and the Air War College, he has served with fighter/ground attack squadrons in Europe and the Middle and Far East.

Recognition Quiz

This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

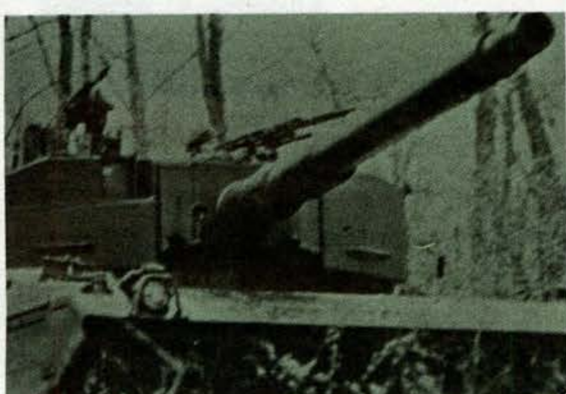
(Answers appear on page 76)

1

2

3

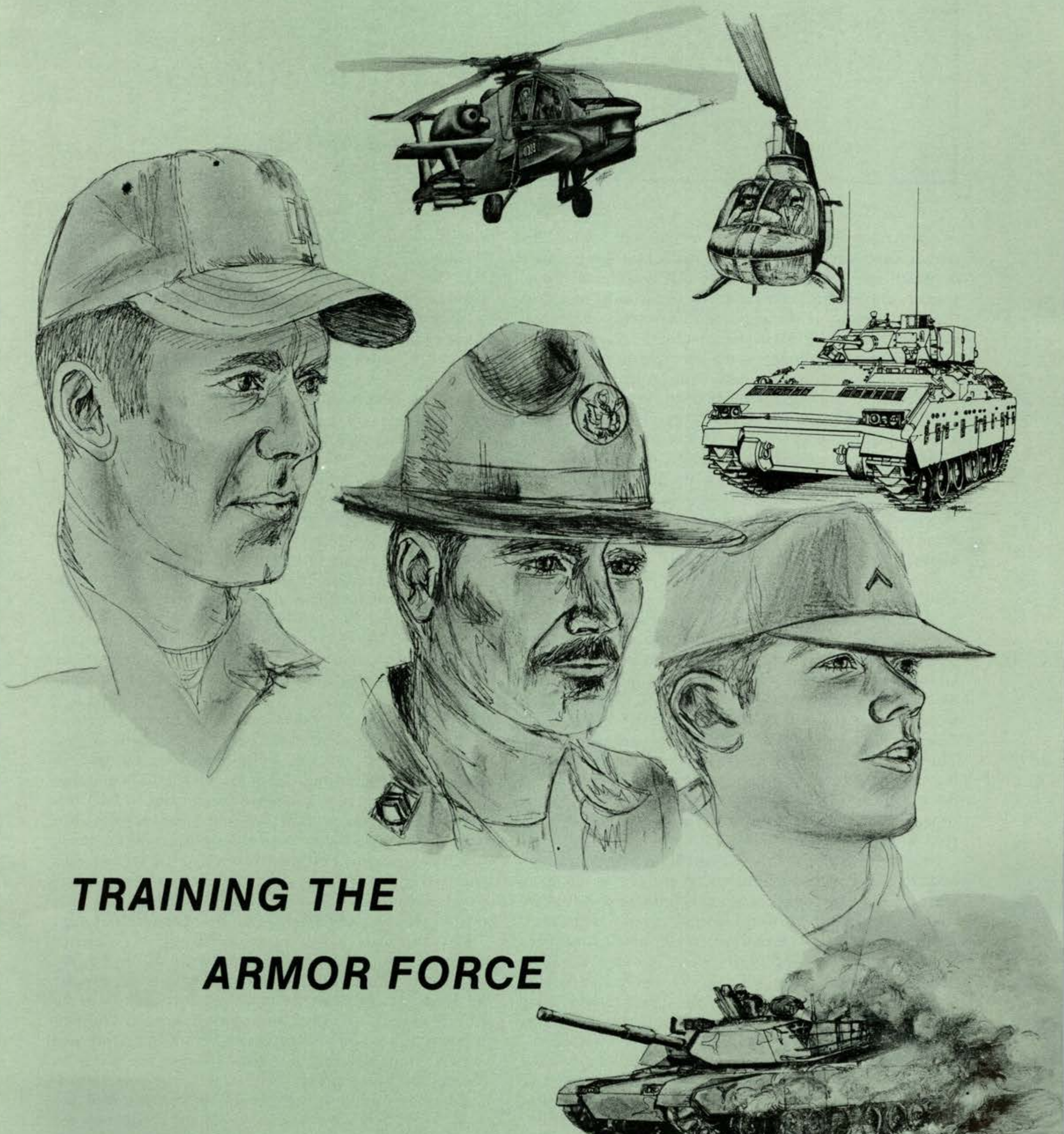
4



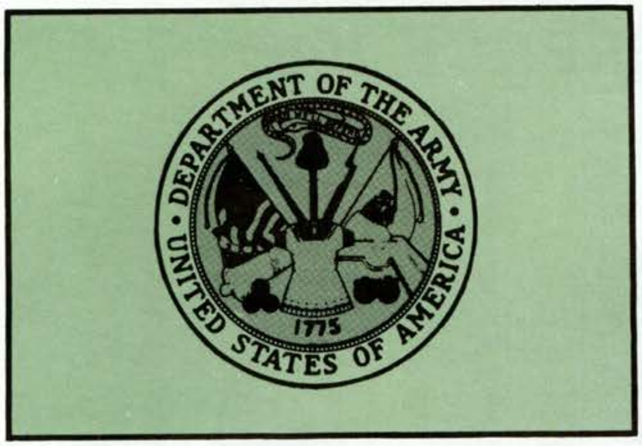
5

6

ARMOR CONFERENCE 1980



TRAINING THE ARMOR FORCE



Keynote Address

LTG Glenn K. Otis
DSCOPS, DA

The Armor Force is not just a bunch of tanks. The Armor Force encompasses every skill of the Army and is manned by dedicated people—officers, noncommissioned officers, and civilians. As a matter of fact, less than 50 percent of the soldiers in an armor battalion carry the armor skill MOS. That being the case, when we talk about training today and where it is going, we must make sure that we don't overlook the bulk of the soldiers who reside in the various parts of the Armor Force.

Another aspect of the Armor Force is the combined arms team. In today's battle and today's training the combined arms team has a different, new dimension—Army aviation. We don't know yet the full impact of Army aviation and where it is going, but the Armor Force with that aspect incorporated in its combined arms team gives the U.S. Army a dimension of power far above most of our competitors.

Now, against that background, I will discuss the challenges of this decade. The first challenge is the enemy and his technology. If anyone doesn't think that the *BMP* is better than the *M-113,* or that the *ZSU-23-4* doesn't have the division air defense outgunned, and so on, we are kidding ourselves. Some of you may say that we have the gear coming. We have a new *XM-1* tank that is going to beat the *T-72,* and we have the *M-2* and *M-3* fighting vehicles that are going to take care of the *BMP.* Those are coming and are going to be better, but that is a big part of the real challenge. We must modernize our force, and that is going to take a lot of dollars. Dollars that are needed for training and for procuring the people that we need to train.

In modernizing the force, we must include training in how to survive and operate efficiently in a chemical warfare environment. The Soviets have already shown that they are willing to use chemicals; therefore, we must prepare to meet that threat. We are beginning to work on that, but up to now we have not done so well in that type of training. In Europe, all soldiers are equipped with three overgarments for the chemical environment, but there is a shortage of gloves. And, if you are short of any one item of protective clothing, you are not prepared.

The chemical threat also endangers our supply lines. In Europe, we depend to a large extent on the host nations to provide port facilities and transportation, and to handle ammunition, fuel, and other supplies. Unfortunately, the people of those host nations have not been given the equipment for defense against chemical warfare.

On the good side of the coin, we have deployed chemical decontamination companies and they are training and they are training well. They know how to do their job. What we in the Armor Force have to be able to do is to learn how to make the best use of that efficiency.

Another aspect of the challenge presented by the enemy threat is the Soviets' ability to project their power and for using surrogates to help project that power. There are over 2,000 *T-72* tanks in the hands of non-Soviet forces. So if the Armor Force, or any part of it, thinks that we will be faced with any less sophisticated challenge if we are deployed against a non-Soviet force, we would be kidding ourselves.

So what we really have to train up to is the Soviets' modernization and willingness to use chemical warfare and the threat posed by well-equipped non-Soviet forces.

Now for specific challenges, other than the enemy threat, that we face in the eighties—modernization, reorganization, deployment by air and sea, training and simulation devices, subcaliber ammunition, and computers.

Let's start with modernization, something I have already mentioned briefly. The Army is about to step into many new items of equipment. For the past 15 years, our force has put a lot of resource dollars and top-flight people into research and development (R & D) and for that decade-and-a-half, we told ourselves that the equipment would be on us in the eighties. We are there now. The equipment is on us. It is out of R & D and being procured with our hard dollars. But we won't receive it in integrated sets. It will come to us as individual systems and we are going to have to learn how to use it that way.

Now the Devil's Advocate might say, "If you are getting a new *XM-1,* just replace the old *M-60A1* or *A3* with the new tank and charge on." It isn't that simple. We have to learn how to use that new tank with its different capabilities and improved equipment. We have to learn how to lash it up with that infantry fighting vehicle that we haven't had before. We have to understand how to put it together with the new sensors and how to handle it with attack helicopters. And, we must decide how we are going to employ it when we get that multiple launch rocket system that is going to give

us that better volume of fire from the artillery. How many of us have really wargamed what it is going to mean when an enemy approaches an area that scouts had reported clear of mines and suddenly finds it full of them because we delivered them with artillery. That is a tremendous new dimension in war. It is all a part of the challenge of modernization.

Money is also a part of that challenge. If we procure just enough new equipment and weapons systems for the Active Army and the eight Reserve Component divisions that make up our 24-division force, it will cost 44 billion dollars—dollars that we don't have. Some of that 44 billion is going to impact directly on training. So part of the challenge of modernization is to be able to train and understand how to use our new materiel in a constrained resource environment.

Reorganization is yet another aspect of the challenge of the eighties. The new equipment we are getting and the new doctrine, tactics, and techniques that are being developed for using it, require a very hard look at what kind of organization we will have to have. The Training and Doctrine Command is doing just that with its series of studies for Division 86, Corps 86, and echelons above the corps.

But even if the Army did no studies or reviews of where we are going, we would have to reorganize to incorporate the multiple launch rocket system somewhere in the force. We would also have to reorganize to take care of the stand-off target acquisition system and those remote battlefield sensors. Once we decide to do all of that, what do we do about supporting that force? The point is that with modernization and reorganization, the training challenge for the Armor Force is even more magnified.

"If war comes, part of the total force is going to deploy by ship, and there are dozens of kinds of ships, each requiring a different way of loading."

Reorganization may create a larger division. A fourth brigade of aviation is a sure thing. Its shape is yet to be decided. But it will be there. Therefore, the division gets bigger or we have to take something away.

All of the reorganization details aren't available, in fact, they haven't been approved yet. But they are coming and they will challenge us within the next year. We have to be able to handle that and train to it.

There is another challenge for this decade. It's one that has always been there and it is one that we have not looked at very well. It is a thing called deployment. Today, 60 percent of our total force, including units of the Reserve Components, is in the United States. If deterrence fails, that part of the force has to go somewhere and only a small part of it is trained properly for deployment.

Last fall the 1st Battalion, 66th Armor of the 2d Armored Division conducted a no-notice deployment to Europe where it drew prepositioned equipment, moved to a major training area, participated in a field training exercise, and fired all weapons. The battalion did that very well. But we found some problems.

For example, practically all posts have mockups for training in loading *C-130* aircraft. But units are not going to deploy from the continental United States in *C-130s*. They are going to go in *C-141s*, *C-5As*, and the civilian reserve air fleet of Boeing *747s* and *707s* and similar aircraft, and they must learn to load those planes.

If war comes, part of the total force is going to deploy by ship, and there are dozens of kinds of ships, each requiring a different way of loading. This is a challenge that we haven't addressed very well, but we must.

"If a unit has to deploy with its equipment and packs it on military pallets, it can't use the planes of the civilian air fleet unless they are modified for war."

That civilian reserve air fleet can accommodate military passengers if they go without their gear that normally accompanies troops. But if a unit has to deploy with its equipment and packs it on military pallets, it can't use the planes of the civilian air fleet unless they are modified for war. There is a program today for modifying the reserve air fleet, but until that is done we will have to learn how to go both ways.

As for ships, NATO has provided us with 600 of them to be available at our call for deployment of our forces. But the ships are of all types and tonnages. For example, there are those that are configured to carry lighters aboard ship, some are "sea trains," and others are designed for roll-on/roll-off cargoes. So, as we train the Armor Force for war, we must train it for deployment by any of several means of transportation.

Now for a discussion of the last, but by no means least, challenge we face in the eighties—dollars and what we must do to make the best use of them for training.

The training dollars for our Army have to be increased. There is no question about it. Training is just more expensive today and it will be more expensive each year of this decade. On the other hand that great set of new gear that is coming on board also takes big dollars and our defense budget is probably only going up by no more than a modest bit above the inflation rate.

"If we are going to pour money into modernization, and if the cost of training is going up by 40 to 70 percent, we have to realize that billions are involved."

If we are going to pour money into modernization as we have to, and if the cost of training is going up by 40 to 70 percent, we have to realize that billions of dollars are involved. The Armor Force had better understand what that challenge means. It is not just a case of recognizing that fuel is going to be short, ammunition is costly, and equipment and spare parts are also. It is a matter of recognizing the challenge and competition for modernizing the Army, reorganizing to take care of that

modernization, and being able to fund it with the dollars that are available. As an example, a light antitank weapon or LAW costs $111 today. When the *Viper* that is to replace the LAW gets to the field, it will cost about one-half billion dollars per year in the near future.

We would be less than realistic if we do not realize that with that kind of training, ammunition cost, and the vital necessity for modernizing the force, we can't get there from here. So, when we look over the remainder of this year's ammunition allocation and it looks tough, we must accept the fact that it is going to get even tougher.

"We should look to the young people who haven't had their minds set by being knocked around in a tank for too many years."

Therefore, we must come up with the right response to overcome this challenge.

Here are some of the directions that perhaps we should go.

To begin, we must train the trainer. That is a glib expression that we all have used, but it shouldn't be all that glib. It should mean something very real for all of us. We are all trainers. We must look at all of the training gear and training aids that are being offered by the manufacturers. Some of it is no good and we will reject that, but some of it is outstanding. We, as trainers of the Armor Force must agree to what is good, what is bad, and what is useful for this decade. To do this we should look to the young people who haven't had their minds set by being knocked around in a tank for too many years. They are still innovative. They can think and conceptualize. They should look at what is available and tell us what we should be purchasing.

But training the trainer means more than just procuring equipment. We must make sure that our subordinates are coming up the right way. We can't train the Armor Force unless we divide up the responsibilities and capabilities in the proper way. For a good many years, we haven't done that very well. It is the job of the officer corps to provide the resources—that's the dollars, time, equipment, and people. It is also the job of the officer to do the planning and make facilities available for training. It is the job of the noncommissioned officer corps to conduct the training and do it so that the soldiers are thoroughly trained in individual and crew skills.

"It is the job of the noncommissioned officer corps to conduct the training and do it so the soldiers are thoroughly trained in individual and crew skills."

Some officers have been wont to spend so much time training soldiers that they forgot about the planning and allocations. Furthermore they were going around the sergeants to do it. Let's get that back on track. Let's have the officers do the detailed planning about what needs to be done, where it can be done and how, and then turn that job over to the sergeants.

That also means that the sergeants have to be trained. Hence, the noncommissioned officer education system (NCOES) is vital to the NCO corps and it is another area in which we have not done very well in past years. We have to support that program better than we have before. Training the trainer and understanding our roles as officers and noncommissioned officers are the keys to success in the resource constricted environment of this decade.

One other response to the challenge of dollar constraints is that of innovation. People in units of all types world-wide have come up with some great ideas for doing very interesting things in training. Our job is to take the best of these innovations and spread the word.

As an example, the 9th Infantry division has devised an outstanding method for training air defense units and the Air Defense School will be promulgating that system. In Europe, at Baumholder, interesting things are being done with a fire coordination exercise with subcaliber devices on a very small piece of range. The exercise is so designed that it tasks the company commander to use all of his weapons systems and enables him to see the result—all in an area that is only 600 x 300 meters.

"The challenge is not just the enemy, but the dollar and resource constraints, and the modernization that we need to make."

Other needed innovations in training include conduct-of-fire trainers and wider use of computers. We need to be able to train to shoot—not just tanks, but a variety of weapons. We need to go after those kinds of things. If we don't get them and find a way to afford them, we will never be able to afford to shoot all that service ammunition.

Innovative things are being done with computers to teach terrain appreciation. One system is capable of presenting a piece of terrain from a map in two dimensions and as it would be seen from a low-flying aircraft, and from the ground by friendly forces, and by the enemy. Those are but a few of the innovations that are available to us.

In summary, what this decade of the eighties holds is a tremendous challenge for the Armor Force and the Army. That challenge is not just the enemy, but the dollars and resources, and the modernization that we need to make. We have already set the course to procure all that new equipment. That is no longer a question. It's here. What we have to do is to learn how best to use it. That challenge for Armor and for all of us is probably the toughest one the US Army has to face, at least in our generation.

Armor Training Strategies for the 1980's

MG Thomas P. Lynch
CG, USAARMC & Fort Knox

The Army modernization program continuing throughout this decade requires us to take a careful look at training the people who use the equipment. Ultimately, even the most technically efficient military force in the world will have to rely on the stamina and courage of its individual members—qualities which result from discipline and training.

Soldiers today are being asked to learn more than ever before; therefore, we have to narrow their field of learning to the job skills needed for success on the battlefield. To achieve this we must concentrate on the specific critical tasks necessary to operate weapons systems to their design level of effectiveness consistently in combat.

The fact that our Army has global commitments which result in a constant turbulence of personnel must be considered. The effects of turbulence can be minimized through standardization of training and tactical operations, not personnel micromanagement. Our soldiers must be able to join a unit and continue to perform as they were taught by the institutions or previous units. We cannot continue to cause our soldiers to relearn their jobs on the battlefield simply because their new unit operates in a nonstandard mode.

The Armor Center is pursuing solutions to these problems and others in our training strategy for the 1980's. This strategy touches every area, from officer and enlisted training through unit training. It is designed to provide armor crewmen and leaders with the right skills for the job at the time that they need it.

Officer training throughout the Army and armor will undergo a significant change in the near future. This change results from the Chief of Staff's recent decision which implements the recommendations from the Review of Education and Training of Officers (RETO). Actually, we have been moving in that direction for the past couple of years through revisions to the Armor Officer Basic (AOB) course and a careful study of the Armor Officer Advanced Course (AOAC).

AOB has been extended to 15 weeks and is oriented squarely on branch qualifications for new lieutenants. It is a demanding course which emphasizes the combat function of tank and cavalry platoon leaders. From the feedback we receive, our new lieutenant is a well-qualified officer ready to perform as a platoon leader.

RETO changes will allow us possibly three additional weeks to continue with the training, and to add to the training we now provide. Hopefully, we will be able to broaden the educational base of the new officer to better qualify him for initial duties in the platoon and company.

In the case of captains, we have been studying the advanced course to find ways to better prepare him for command in combat. We have also been looking into staff requirements for captains while orienting instruction on the staff functions needed in combat. At the Armor Center, we will conduct a precommand course for company and troop commanders and functional staff courses for officers designated for staff assignments. The precommand course teaches the skills necessary for command.

All of our company and troop commanders will learn how to fight according to some standardized doctrine. We do not want to limit initiative, but we want to put every commander on the same ground before he takes command.

Our companies will train to do things according to sound principles and in generally standardized ways because of what we teach their commanders. Through that approach, training can help achieve a uniform standard of performance throughout the force. Ultimately, soldiers joining a unit will find that the way it operates is much the same as it was within his last unit.

In the functional courses, one of our objectives is to standardize staff work toward the same goal. The functional courses will address the four primary staff functions and maintenance.

In addition to the precommand and functional course structure, RETO initiates a system of performance testing for company grade officers. The Armor Center had been pursuing that goal for some time. An officer is a member of a crew, and he has to be able to pull his share of the load. The only way we can be sure that he can is to test him.

Armor's strategy for training enlisted crewmen during the 1980's has been published since August of last year. In January of this year we received permission to proceed with the more important aspects of our proposal. The strategy is based on the realization that we cannot afford to teach everyone everything a soldier needs to know.

Instead, we will teach armor soldiers to do well those

things necessary to function as a member of a tank crew in combat, because if the crew doesn't function, the tank, and ultimately the platoon, cannot survive. It takes the collective skill of the entire crew to maximize the weapon.

The strategy we submitted for the 1980's recognizes that NCO training has taken a secondary position, with a predictable decline in quality. We have become complacent in training our NCOs and we must correct this situation. Our enlisted training strategy includes a top-to-bottom phased implementation starting with the platoon sergeant. Since we will implement this strategy from the top down, its progress will be discussed in that sequence.

"We have become complacent in the training of our NCOs and we must correct this situation."

The first enlisted course to undergo change will be the Advanced NCO Course (ANCOC). That course is considered the platoon sergeant course, and it has been changed considerably. The only thing not changed in the course is that it is still 10 weeks long and taught at Fort Knox. The context is totally new. The course is aimed at providing the platoon sergeant the skills necessary to lead a platoon on a battlefield. The emphasis on tactical skills is apparent, and considerable time is spent in the field learning them.

Whenever possible the platoon sergeant training is integrated with that of the platoon leader to provide standardization and to give both a better appreciation of the duties and responsibilities of the other. One of the most significant changes to platoon sergeant training is the incorporation of master gunners' skills in the Program of Instruction. A new platoon sergeant is expected to return to his unit as an accomplished master gunner, fully prepared to teach correct gunnery methods to his platoon. That effort, along with gunnery standardization efforts, will serve to standardize gunner training. These training innovations should result in procedures that will go a long way toward offsetting the loss of proficiency associated with personnel turbulence.

"The new course will teach the cavalry platoon sergeant his tank from the ground up, sharpen his combat skills, and prepare him for his place in the platoon."

The pilot course for the platoon sergeant was completed in April and evaluation of the course is nearly complete. Indications are that the course is what we need and accomplishes what we want to do.

A pilot course for the cavalry platoon sergeant, using the same approach began in May. It is expected to be a success, and barring unforeseen delays or micromanagement, the course should be in the system during our first quarter of FY 81. One of the goals of the cavalry course is to provide for the transition of the scout from the scout vehicle to the tank. A cavalry platoon sergeant operates from a tank, but all of his prior training was on scout vehicles. The new course will teach the cavalry platoon sergeant his tank from the ground up, sharpening his combat skills, and preparing him for his place in the cavalry platoon. We will soon see stronger platoons throughout the force.

Armor considers its tank commanders to be the key to success on the battlefield. In our enlisted training strategy we recommend the centralization of the Basic NCO Course (BNCOC) at Fort Knox for all tank and cavalry vehicle commanders.

The training strategy includes the integration of tank commander training with basic armor training in its final week. The two courses would merge for intensified gunnery and crew drills with generally the same objectives as the integration of platoon leader and platoon sergeant training. The new crewmen would have the early opportunity to function in a crew, with a tank commander, in tactical situations. Just as importantly, the new tank commander would be exposed to training and working with new crewmen, much as he would find in his unit.

Cost is our major obstacle at this point. In the meantime, we are redesigning the existing BNCOC for exportation to installations conducting the current armor program. The revised course will follow our strategy of teaching combat skills before the new tank commander gets his first tank. We intend to use the course to train tank commanders, regardless of rank, so that every tank in the field has a qualified commander.

"Experience has shown that about 50 percent of the men we train are placed in the wrong job in the unit."

The redesigned course will place tank commander training in the field through the increased use of subcaliber firing. The course is being designed to insure training standardization. Eventually, we still hope to move all tank commander training to Fort Knox where we can train the entire crew to work together before graduating them to the unit. We are confident of an improvement in the tank commander, and hopefully, he will know his tank, know how to employ it on a battlefield, and be confident in the use of this weapon. We plan to field the new course by the end of this summer as an exportable package.

Perhaps the greatest departure from our present training will take place in the training of basic armor crewmen. We now train armor crewmen at Fort Knox using the one station unit training, or OSUT. Training consists of 13 weeks of integrated basic and tank skill training. We graduate crewmen qualified either as a gunner, loader, or tank driver. Experience has shown that about 50 percent of the new men we train are placed in the wrong job in the unit.

Personnel turbulence and personnel mismanagement account for the majority of that. The result of that

turbulence is that we have not been able to anticipate and train the right seat-specific MOS to meet the unit replacement needs. Visits to the units show that soldiers trained as drivers are used as gunners or gunners as drivers because the unit commander needs them in that seat. The combination of the wrong man in the job and the normal personnel turbulence in the unit places an added and unacceptable training burden on a unit commander.

New training strategy calls for training a system-specific crewman, rather than a seat-specific crewman as we do now. A graduate of the system-specific course will be qualified in three subordinate crew positions of a given model of a tank. The new training allows a commander a greater voice in crew assignments, reduces the negative effects of turbulence, and creates greater flexibility in crewmen.

This is especially important at the platoon level where the fighting takes place. We must get away from micromanaging the platoons and allow the platoon leader and the sergeant to assign the better-trained crewmen where they can best use them. The system-specific course will track with the rest of our training in that it will concentrate on combat skills. The new soldier will be placed on the tank early in his training and everything that can possibly be taught in a tactical environment will be taught there. Nontactical settings will be used to the minimum. When they arrive for training, new soldiers will be placed immediately in a crew and kept there throughout the training cycle.

"The objective is to graduate a crewman who is accustomed to living with his tank and crew in a tactical environment."

The objective is to graduate a crewman who is accustomed to living with his tank and crew in a tactical environment, and one who appreciates a need for teamwork. All new crewmen are to receive the same training and hopefully will enter their first unit ready to take their place anywhere in the crew.

Cavalry scouts are going to be trained using the same principle as those of the tank crewman training. The MOS 19D task list has been approved and basic reconnaissance training is being designed around the combat-critical tasks of that list. The course will run about one week longer than the tank crewman training.

We are also working with the Ordnance Center on a cooperative program to design a system-specific mechanic course for armor. The result of our joint effort will be a better mechanic qualified to maintain a specific type of tank or other fighting vehicle in a given type of unit. The system-specific crewman and mechanic will give the commander people who are trained to meet the battlefield needs of the unit's equipment.

Concurrent with the system-specific training we will be going forward with reduction in the number of MOSs in CMF 19. These reductions will impact on soldier's manuals and SQTs now in the field. We hope to trim the bulk from that literature and organize it so you can better tailor it to your needs.

There are also some initiatives to improve collective training. Today, there is a considerable training gap between individual and unit training. That void falls in an area we can least afford to neglect, crew training. If you have followed our approach to training in the institution, you detected an emphasis on preparing the individual to operate as a member of a crew. Once again, in armor, anyone regardless of their rank, who travels in a tank, who operates out of a tank or cavalry vehicle, is first a member of the crew. Institutional training is going to get pointed in that direction.

"Collective training begins at the battalion level, and other than gunnery, there is little emphasis on crew training.

Collective training, however, begins at the battalion level and, other than gunnery, there is little emphasis on crew training. As noted earlier, the weapon system is only as good as the crew operating it. Therefore, we cannot ignore the importance of training the crew. To help bridge the gap, we are developing a set of standardized crew drills. The objective is standardization of the crew functions which are most critical to combat deployment of the weapon system. Concurrent with the development of these drills, we hope to find a way to link them to the individual SQT.

The drills will serve to standardize crew functions to offset the effects of personnel turnover within the crew. When they have been perfected the crew drills, the drills will become a part of institutional training and exported for use in the field. The objective is to place emphasis on the crew, provide the incentive to work together, and give the tank commander a training tool that he needs to build crew proficiency.

This has been a broad outline of the number of changes in the way that we train in the future. We are convinced that this is the way to go. Standardization resulting from this strategy will go a long way in reducing the negative impact of personnel turbulence and it will improve overall *real* unit readiness. Orientation on the needs of combat for all ranks will serve the same purpose. Emphasis on system-specific training in a crew environment will better serve the equipment being fielded. The establishment of a training bridge between individual and collective training will develop crew skills and make collective training more meaningful.

"Standardization will go a long way in reducing the negative impact of personnel turbulence and it will improve overall real unit readiness."

Finally, the strategy serves equally as well in peace or war without modification to the training program. Our mission is to prepare the armor force for combat in a highly lethal, mobile, integrated battlefield.

Forge The Thunderbolt!

USAREUR Training Strategies For The 1980's

BG Crosby E. Saint
CG, Seventh Army Training Center

As the Army's trainer in Europe, serving both as the Assistant Deputy Chief of Staff for Training in the US Army Europe (USAREUR) and as commander of the 7th Army Training Command, I can tell you that training is riding a wave of renewed interest both in and out of the Army. There is major concern at all levels about the training readiness of our soldiers and of our units. We welcome the military and public debate for we are confident that our training programs are making more effective use of the manpower and equipment resources available to us. When our training improves, our technical military proficiency improves, our soldiers become confident in themselves, their equipment, and their leaders, and we improve our ability to kill the enemy.

The USAREUR philosophy is to sustain combat training readiness to enable us to fight on the European battlefield today.

Training challenges and opportunities present in the life of each USAREUR soldier and unit are numerous. They include:

- Individual and collective training geared to Soldier's Manual and Army Training Evaluation Program (ARTEP) standards.
- Qualification gunnery—individual, crew, and platoon.
- Competitions—internal and international.
- Interoperability at numerous levels.
- Readiness tests and walks on the General Defense Plan terrain and large-scale exercises with our Allies.

USAREUR has over 230 battalions and over half of these are in the lead throwing business. In Southern Germany, we have battalions located singly and in groups from Augsburg to Bad Hersfeld, north of Fulda; from Amberg to Baumholder; in Berlin; and now in Garlstedt, near Bremen. Our battalions face vastly different training environments.

Therefore, each battalion must construct a training program that involves its own garrison, Local Training Areas (LTA), local Maneuver Rights Areas and Major Training Areas (MTA), with most of its training being conducted locally.

It is an interesting fact that approximately 85 percent of the individual Soldier's Manual skills of the infantryman can be taught within garrison.

A major USAREUR goal is to get the necessary training aids to support the individual training program to the noncommissioned officer—the sergeant—the trainer.

We stress the learning resource center as a major supporter of the trainer. These centers consolidate the aids and materials to support the training for military occupational specialties (MOS) of personnel assigned to the vicinity of the center. Our intent is to ensure that the required materials and aids are present to support the individual training requirements of each MOS. Our efforts have institutionalized in USAREUR Circular 350-1. The objective is to make it easy for the trainer to obtain those materials and aids he needs to train to Soldier's Manual standards.

Another major element in the home station training program is the LTA. USAREUR's 223 LTAs provide everything from small arms ranges to platoon and company maneuver areas. Not all of these LTAs as currently configured are usable by the highly mechanized forces in Europe today. Indeed, a great number of the usage agreements place restrictions on their utilization. Areas that served the post-World War II foot- and truck-mobile American Army in Germany so well are, in many instances, of marginal value today.

For many years, we didn't pay much attention to a number of these areas as the composition and location of our forces changed. As a result, even with documented agreements, local populations came to look upon some of the areas as nature preserves or convenient community trash dumps. When we reasserted our legal rights, some shocks were created in local communities that reverberated to the national level. However, understanding exists concerning the vital role we play in Western Europe and I feel confident that with thorough planning and proper communications we can successfully revitalize the LTAs.

USAREUR, within the past year, has reevaluated the LTA situation. First, we determined where the battalions were located and in what numbers. Next, we examined each battalion's individual and collective training requirements and how they could best be met. All of this resulted in geographic groupings we refer to as Training Management Areas (TMA). Then, we developed goals, standards, and priorities for development in each area. We have institutionalized the concept

through a regulation and, in conjunction with the major subordinate commands, we have developed a program to allow us to regain rights we have lost locally and to more readily identify and track the resources allocated for LTA improvement.

The MTA environment has changed considerably over the years. The 45-day trips to "Graf" are no longer available. In exchange for our use of NATO and other Allied facilities, the Germans now occupy Grafenwoehr, Wildflecken, and Hohenfels for 90 days each year. The available time and resources only allow us to provide each US battalion two 20-day training opportunities a year.

There are three MTAs available to US Forces in the 7th Army Training Command:

- Wildflecken can support only an armor, mechanized infantry, artillery, or engineer battalion at any one time, but it does have the capability for tank and artillery gunnery. Wildflecken will assume increasing importance in our sustainment gunnery programs as the ranges at Grafenwoehr become more sophisticated.
- Hohenfels, while supporting a somewhat larger troop density, is and will remain primarily a maneuver area. It is the only extensive free maneuver area under US control in Germany.
- Grafenwoehr will support 21 battalions in the proper mix. Grafenwoehr is USAREUR's major gunnery training area and will undergo even further development to enable us to train to the standards of the new weapons systems.

All three of these MTAs would easily fit inside the boundaries of Fort Hood. Thus the challenge is obvious when you consider the training requirements of a six-division force in a year cut 90 days short by Allied use of the training areas.

"In USAREUR, the real test of a unit's training is found in its ability to accomplish its mission under actual conditions."

The fourth leg of the unit's training program—the Maneuver Rights Areas—present opportunities not available in the United States. Periodic maneuver on or near the ground on which we will fight is extremely beneficial and our use of these areas has increased dramatically, in the past few years. However, problems do arise now and then, but I must offer a word of praise for the German population and their support of the maneuver of 700,000 heavily-mechanized troops virtually on their doorsteps.

In USAREUR, the real test of a unit's training is found in its ability to accomplish its mission under actual conditions. USAREUR has established proficiency demonstration standards for various sizes and types of units. These standards are fully compatible with the Soldier's Manual and ARTEP concept, clearly outline the training readiness goal, and have raised training readiness to a number one priority along with everything else that has a number one priority. Major training events that present an opportunity for units to meet proficiency standards include a:

- Battalion ARTEP yearly.
- Battalion FTX three times per year.
- Brigade FTX three times per year.
- Division FTX yearly.
- Corps FTX every other year.

USAREUR has also approved tank and mechanized gunnery regulations which not only contain suggested sustainment programs, but also contain a training and evaluation outline for crew and platoon gunnery. Units must conduct their yearly qualification gunnery at the crew and platoon level to the standards as outlined.

An attack helicopter gunnery regulation has been developed and a test program for this gunnery regulation will be conducted this summer. Like the tank gunnery and mechanized infantry gunnery program, the attack helicopter gunnery program will establish crew, section, and platoon gunnery standards.

"USAREUR expects to receive about 390 new systems of numerous types, sizes, and degrees of sophistication during the next few years."

The Future

USAREUR expects to receive approximately 391 new systems of numerous types, sizes, and degrees of sophistication during the next few years. Some will be issued directly to the unit and will fit into the unit in a rather routine manner. Others will require the support of new equipment training teams, and a few will need a centralized new equipment training program in the Vilseck-Grafenwoehr complex. The *General Abrams* tank, TACFIRE, the Fighting Vehicle Systems, and *Stinger* are examples of systems that require a centralized training approach. I believe the training impact on the units is obvious. The Army, and USAREUR is no exception, is still in the process of absorbing the fruits of the newest Army training management system. USAREUR is supporting the individual training effort by getting the aids to the trainer.

"Periodic maneuver on or near the ground on which we will fight is extremely beneficial and our use of Maneuver Rights Areas has increased."

We have had some problems with publication distribution, and reception by the unit. We have instituted the PUSH system whereby publications are shipped directly to the battalions from the United States and we are monitoring this system to insure that it is meeting our needs.

Another innovation in training support—the Battalion Training Management System (BTMS) workshop

series—has been offered to USAREUR units and we intend to start training in August. We have introduced the workshops to the Basic Noncommissioned Officer Course at Vilseck and our new training regulations clearly reflect and support the Army training system.

During the past year, we have instituted a major drive to procure training devices. These are devices that are here now and that will train soldiers to perform to standards on real equipment and sustain our capability throughout the year. These devices include a multipurpose indoor range, a tank gunnery/missile target system, and an air defense domed trainer.

The multipurpose indoor ranges use a movie film projector system to display various types of battlefields, ranging from urban terrain to jungle paths, to open German countryside. Individual weapons as well as subcaliber devices on tanks, TOW, and *Dragon* can be fired on the ranges.

"The wonderful world of electronics has already been exploited by our European allies in their training device programs."

Currently, we are installing a 35-mm slide system in these ranges which will provide the capability for conducting a Trainfire-type qualification course.

The wonderful world of electronics has already been exploited by our European allies in their training device programs. An example is the electronically-controlled tank gunnery/missile target system that is just now being tested in the US to determine its suitability. Yet, one has been in use in USAREUR for the past year and four more are being procured. These are off-the-shelf purchases and are quite highly thought of by the units that have used them.

Similar devices exist for air defense systems. The technology exists now and is in use in other armies. We are planning to purchase one air defense domed trainer this year to support *Vulcan/Chaparral* gunnery.

Plastic ammunition is another training item that offers an unmatched opportunity to use what appears to be limited LTA space to conduct significant gunnery-related training. For example, the range fan for a .50 caliber round extends to some 6,800 meters. By contrast, the same caliber plastic round has a fan of some 500 meters. Additionally, the plastic bullet is ideal for live-fire training in urban terrain and USAREUR will be conducting a standardization test of plastic ammunition this summer. Our interests are not in comparing plastic ammunition with ball ammunition because ball is obviously a more effective round. Our point is that plastic ammunition can be used to train in places and under circumstances where it would be impossible to use ball ammunition.

Although we do not yet have enough electronically controlled popup targets to support all our training requirements in the MTAs, our ranges at Grafenwoehr are fairly extensively supported by the armor- and infantry-type radio-controlled popup targets. In addition to more purchases for MTAs, we are purchasing what we term LTA target packages for each of our training management areas. These devices are intended to support local gunnery programs, ranging from individual pistol qualification, through the Fighting Vehicle Systems, up to the main battle tank. Their use with scaled targets in combination with plastic ammunition and subcaliber devices offers significant advances over what is available now to units in their garrison areas.

The MTAs support training up to standards in those tasks which cannot be supported by LTAs. We cannot afford to have training effort expended in an MTA on tasks which can be exercised locally. The MTAs must be able to support maneuver and gunnery requirements.

We have a need for reliable moving target systems. This year, Wildflecken will receive four new moving target systems and we will build two at Grafenwoehr. We must provide a challenge equal to the full capabilities of our new systems and troops. This includes providing areas which allow firing from the moving vehicle and which accommodate the associated range fans.

Since military units always have been and always will be required to provide a certain amount of their own housekeeping support, diversions while at the MTAs have been fairly extensive. Now, we are making a start at running certain ranges with local national personnel. Essentially, the unit will move on to a range with it fully set up and operational. The benefits are obvious—more troops getting all the training while increasing our capability to train more units without increasing training time or land holdings.

Procurement of automatic, electronically-controlled targets will continue. These are essential to an acceptable depiction of the substantial, rapidly-moving, and elusive target array that is expected on the European battlefield. During the first half of the 1980's, an extensive reconfiguration of ranges will take place.

At Grafenwoehr, the major armor qualification ranges and those ranges leading to that qualification will be moved from the southwest corner of the reservation to the north-east. The repositioning will accommodate the required range fans more readily and will also have a positive impact on energy consumption.

"We are working with the Air Force to establish a set of uniform procedures for incorporating air power into the battle."

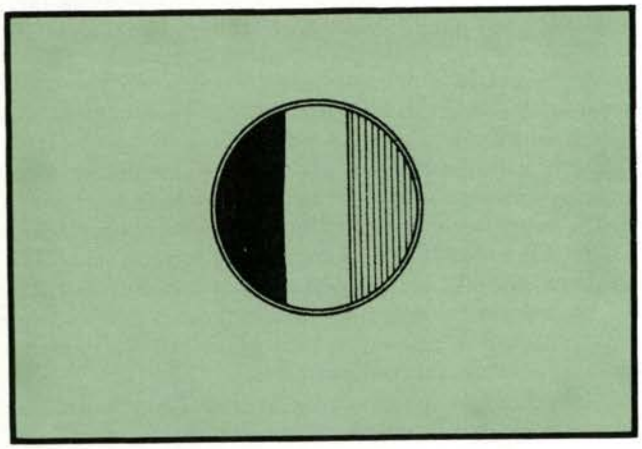
The platoon defense battle course is an example of the development plans of the new ranges. It will have a target array that depicts a threat force moving across the battlefield. There will be enough target pits and positions to give the capability of presenting each platoon with a unique and variable threat array. It will eliminate the canned exercise and provide a number of prepared fighting positions that will enable the platoon leader to move and fight his platoon from a variety of positions and areas.

The infantry and cavalry fighting vehicles present a new training requirement and will require some unique solutions. The infantry attack and defense battlerun courses present multiple and variable target arrays similar to those of the armor battleruns. These ranges require a fairly extensive road network because the soil of Grafenwoehr can't withstand free maneuver. Multiple routes and a great variety of defilade and hide positions will enable the crew or platoon to attain a great degree of tactical realism. Although a live fire exercise at the company team level is not required in USAREUR, we do intend to offer the facilities to support such a program and the integration of artillery, engineers, and aviation elements will be a reality.

The aviation training program in Europe is growing along with the ground force structure. USAREUR has implemented a no-notice gunnery program which involves a periodic alert of an attack helicopter platoon and its movement to a MTA for a live fire exercise.

In the area of joint air attack teams, we are working with the Air Force to establish a set of uniform procedures for incorporating air power into the battle anywhere across USAREUR. We are using Hohenfels to support the program and have obtained plastic replicas of *PT-76* and *T-54* tanks that will be emplaced in fixed company- and battalion-size target arrays. These arrays will be used in a nonfiring mode during the development of standardized procedures. Air Force *A-10* aircraft can land at both Grafenwoehr and Vilseck airfields and we intend to use this capability to allow a better interchange of ideas during the SOP development process. Later, artillery and maneuver elements will be integrated into the program.

The goal of USAREUR and the 7th Army Training Command is to sustain combat proficiency at every level within the command at all times. USAREUR is where the high-tempo training actions is and it is where combat readiness is the foremost thought.



Review of Education and Training for Officers

MG Donald Rosenblum
DCS for Training, TRADOC

Officer training in the U.S. Army is undergoing a complete change as the result of a study known as the Review of Education and Training for Officers (RETO). In the future, the education and training system for officers will give them exactly the training they need, when they need it.

Cadet training, as well as lieutenants and captain training, will be standardized by a military qualification standards program (MQS) that will allow officer basic courses to start from a common level. These courses will be expanded as necessary for each branch to better prepare lieutenants for their first assignment.

Advanced courses will be replaced by precommand courses (PCC) and functional courses which will train students specifically for the next job.

All officers will attend a Combined Arms and Services Staff School, known as CAS^3 or CAS Cube, between their 7th and 9th year of service to prepare them to be staff officers.

The Armed Forces Staff College and the Command and General Staff College will be continued and approximately 980 officers will attend them each year.

PCCs have been implemented for officers being assigned to command combat arms, combat support, and training center battalions and brigades. PCC for command designees in combat service support units will begin in July 1980.

The most important feature of the new officer training system is that an officer is trained for a specific job just before he goes to it—not years before or after. The same goal is being set for the basic and advanced noncommissioned officer courses.

Qualification standards are the very heart of the programs stemming from RETO. MQS are designed to provide all officers with a uniform system of education and training, regardless of source of commission, and establish detailed, uniform standards of performance through the grade of captain. MQS will be applied at three levels: MQS 1 during precommissioning, MQS 2 at the lieutenant level, and MQS 3 while an officer is serving as a captain.

There will be a military task component and a professional education component at each MQS level. The military task component will consist of those actions an officer *must be able to perform* to be qualified in his speciality. The professional education component will be made up of the broadest skills and those things officers *need to know* as part of a continuing professional development.

In the precommissioning phase, the military tasks are

common to all specialities and emphasize those basic things that soldiers must know and do. The educational component of the MQS includes the requirement for completion of courses in written communication, human behavior, military history, national security policy, and management. The courses may be part of a degree program or be added to it, but must be completed before MQS 2 can be certified as being fulfilled.

Certification of MQS 1 will be done by administering a diagnostic test at the beginning of the officer basic course (OBC). Remedial training and retesting will be done during the OBC, if necessary, and the school will certify the completion of MQS 1 on the academic efficiency report.

"In the future, all captains must attend a command and staff course where they will learn what staffs are, what they do, and how they do it."

An important part of MQS 2 will be a directed reading program. This will introduce lieutenants to the literary works of the military profession, develop the habit of reading professional literature, and encourage professional discussion. There will be a requirement to read eight books chosen from a list divided into classical military, contemporary military, and specialty reading categories. Completion of MQS 2 will be certified by the officer's unit in a letter to MILPERCEN.

At the captain level, a separate MQS manual will be published for each speciality and will include a reading program similar to that for lieutenants, but it will probably require the captain to read twice as many books. Additionally, a captain must complete CAS^3 before he can be certified by his unit as having fulfilled the requirements of MQS 3. The certification is forwarded to MILPERCEN by letter.

OBCs will be expanded to insure that lieutenants are adequately trained for their first assignment. This expansion will not be automatic, but will be accomplished on school-by-school basis and as required by an analysis of the skills and tasks that must be taught and mastered. The courses must remain as temporary duty assignments (TDY); therefore, they cannot exceed 19 weeks and 2 days.

"RETO has produced a program that gives an officer the training he needs, when he needs it, and establishes professional standards that he is expected to meet."

Officer advanced courses will be discontinued and replaced by PCC and resident and nonresident functional courses. If an officer is going to be a company commander, he will attend a PCC on TDY. The length of the course has not been determined, but it is estimated to be 5 weeks. If an officer is going to be an S-1, he will attend a course for S-1s, and if he is to be a motor officer, he will attend a course for motor officers, and so on. That is to be the restructured captain's training.

A few months ago, only about 70 percent of the officer corps was *selected* to attend a staff college. The restructured officer training concept changes that dramatically. In the future *all* captains *must* attend CAS^3 where they will learn what staffs are, what they do, and how they do it. They will be trained in common, collective staff skills, however, not in how to be a specific special or general staff officer—that will be done in functional courses for S-3s, S-4s, G-2s, G-3s, etc. It is believed that the training in collective staff skills is absolutely necessary if the Army is to have effective staffs and staff officers.

CAS^3 will probably consist of a nonresident phase, a qualifying examination, and a resident phase. However, CAS^3 is planned for presentation early in the 7th year of service and it may prove too much of a burden for a captain who is commanding a company, and who has to read 18 professional books in addition to attending TDY courses to qualify in MQS 3. Therefore, the first phase may have to be part of the resident course. CAS^3 is programmed for Fort Leavenworth, KS, but there is a possibility that it will be presented at several sites and managed by Fort Leavenworth.

The nonresident phase will provide the fundamental knowledge that an officer needs to function within a staff setting, plus that information which doesn't lend itself to the staff team instructional method. It will be mailed to the officer in his 5th year of service and will be a requisite for the second phase of the school. Students will be required to pass a locally proctored examination to complete the nonresident phase.

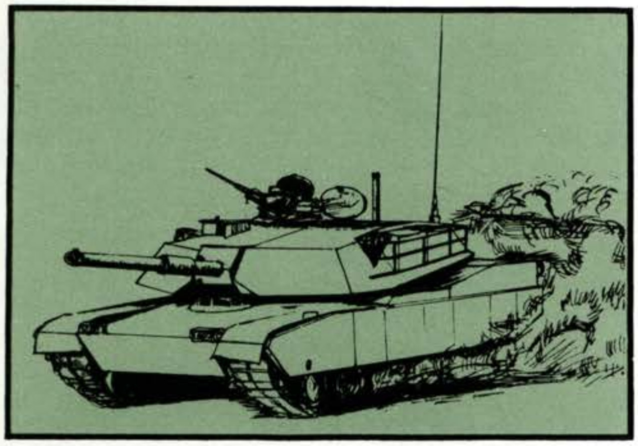
In the resident phase of CAS^3 the officer will apply what was learned in the first phase by performing in an active staff role. There will be a minimum of programmed instruction. The student will learn by doing things while functioning as a staff officer.

There was considerable discussion during the planning of CAS^3 as to whether the course should be limited to tactical matters. The consensus, however, was that there are many installation functions that most officers know little about that are important to daily operations. Therefore, those functions will be addressed in CAS^3 along with tactics and doctrine.

RETO also produced a recommendation for a PCC for battalion and brigade command designees. The course is tailored by branch and command and is designed to provide refresher training in selected functions and duties. It will also insure common understanding of current Army training, personnel and logistics management, and tactical doctrine. The focus of the course is on how to train, maintain, command, and fight.

Restructured training is not limited to the Active Army. Reserve Component options are being developed to insure that the unique needs of the National Guard and U.S. Army Reserve are met. In keeping with that, the first CAS^3 beginning in April 1981 will have 32 spaces allocated for Reserve Component officers.

RETO has produced a carefully planned program which gives an officer the training he needs, when he needs it, and establishes professional standards that he is expected to meet.



XM-1 Update

MG Donald M. Babers
XM-1 Project Manager

A lot has happened in the *XM-1* program during the past year. There have been some problems, but there have also been a lot of successes.

The major problems centered around the air induction system, engine, and track.

Those problems have now been solved. In better than 18 months, and 47,000 miles, there has been no damage to the engine due to dust ingestion during tests at Forts Knox and Bliss and White Sands Proving Ground. Those tests were run in the red clay dust of Fort Knox and in the desert dust where the problems with the air induction system were first encountered.

Track retention has been improved by increasing track tension, readjusting road wheel loading, and adding a paddle wheel and mud scraper to the sprocket. It works fine, but we can't say that we have a tank that will never throw a track. Track retention has been improved to the point, however, where it is comparable to the *M-60* series and in some cases even a bit better.

In the area of reliability, availability, maintainability, and durability (RAM-D), we have met or exceeded all the DT/OT II requirements.

During the Fort Knox tests, maintenance was performed by contractor personnel for only one month while soldiers of the test company were being trained at the contractor's plant in maintenance procedures. After that, all organizational maintenance was performed by company mechanics.

As for durability, there was a requirement that the power train—engine, transmission, and final drive—achieve a durability factor of .50 probability of going 4,000 miles without a failure. We achieved a .54 probability in 4,000 miles.

Durability was also demonstrated by the performance of the suspension system. As the crews became more familiar with the vehicle, they really stressed the system, but it wasn't until about 8,000 miles that the first torsion bar broke.

Reliability requirement for DT/OT II was 272 mean-miles-between-failures. We achieved 326. RAM-D testing doesn't end there, however.

Production models of the *Abrams* began rolling off the assembly line at Lima, OH in February, and by January 1981, 110 tanks will be delivered. As these vehicles come into the inventory, eight of them will be shipped to Fort Knox for platoon tests similar to those that were run at Fort Bliss. When the data from the platoon tests have been fully evaluated by about May next year, it should lead to the meeting of the Defense Systems Acquisition Review Committee for authorization of full production at the rate of 60 tanks per month.

Following the platoon tests, 55 tanks will be evaluated at Fort Hood during normal troop use and an extended field training exercise. The battalion-sized evaluation will be conducted by the 2-5th Cavalry, 1st Cavalry Division.

There has been a very deliberate effort to put as much realism as possible into the exercise and that has been achieved to a greater extent than has ever been done before during operational testing. The division commander will be given the general terms of the scenario and will have complete control of the operation.

The battalion test will not only verify that the production tanks have what we want in terms of performance, but will also verify the tactical and support doctrine associated with the *Abrams* tank. It is during this test, that we will get some idea as to the tailoring that will be required in the force that supports a division equipped with the *XM-1*.

Tests of *XM-1* production models will not be limited to Forts Knox and Hood. We are going to test tanks in many different environments; at Aberdeen Proving Ground; Yuma for heat; White Sands, where they will undergo electromagnetic testing, and at the Cold Region Test Center, AK.

The second year's production will begin in February 1981, and during that year, we will begin shipping the *Abrams* to Europe. In conjunction with that anticipated deployment, training development has been underway for some time and training equipment is being procured for the 7th Army Training Command, Vilseck, Germany. Organizational maintenance instructors have been trained at Fort Knox and Aberdeen Proving Ground and about 60 direct or general support maintenance mechanics have completed the course so far at the Ordnance School.

Training extension materials as well have been completed. These materials have been validated by soldier target audiences and are ready for export to the field.

Simulators and training devices are also in development. These fall into three general categories; maintenance troubleshooters, driver trainers, and conduct-of-fire trainers. The first prototypes of the maintenance trainers are scheduled for delivery this year and will go to the field in mid-1982 after they are debugged. The driver trainer is being developed on the same schedule.

The biggest challenge in the area of training devices is in the unit conduct-of-fire trainer where two developers are engaged in a competition using prototypes. The contract award for this training item will be sometime after 1982.

"We have demonstrated that the XM-1 can be airlifted in a C-5A aircraft, just as with the M-60."

Logistically, there was no integrated logistics system (ILS) development during the prototype phase of the *XM-1* program. Nevertheless, we are in the seventh printing of publications and have now gone to the special performance aids (SPA) format which some feared would greatly increase the number of pages due to the extensive use of illustrations. That has not been the case—only a 20-30 percent increase was noted—and the SPA format and current publications have become the foundation for all training material that is developed.

Although there was no formal development of an integrated logistics system, the acquisition of repair parts was not overlooked and the provisioning process has been completed. We will support the *Abrams* tanks at Fort Hood from day one just as we have done at Fort Knox. The soldier in the unit, the PLL clerk, and the person who runs the ASL will submit his requisition just as he does for the *M-60s* that have been in the field for many years.

Also in the logistics area, we have demonstrated that the *XM-1* can be airlifted in a *C-5A* aircraft, one per plane, just as with the *M-60*. The tank is also transportable by rail or heavy equipment transporter.

Test and validate has been the thrust of the *XM-1* program all along and it will continue to be as we go into the whole big series of detailed OT-III tests where we hope to get a further maturing of ILS.

"Test and validate has been the thrust of the XM-1 program all along and it will continue to be during the OT III tests."

One logistical area that has presented problems has been that of test sets. When the *XM-1* rolled out for DT- and OT-II, there were seven unique *XM-1* training test sets with enough pieces to fill a large stage. Size was not the only problem. There was concern that it would be difficult to teach soldiers to use them and they didn't work too well to begin with. Additionally, with every fighting vehicle being developed having its own seven to eight test sets, an insurmountable logistical support burden would be created. We decided to terminate that part of the development process. Now we have three test sets for organizational and DS/GS maintenance which are an adaption of the simplified test equipment. Test sets are located at Aberdeen and Fort Knox. At Fort Knox, the Armor and Engineer Board is evaluating the sets and the results look very promising. Ultimately, test sets will be fielded that will be common to the *XM-1, M-60A3,* and *M-2/3* vehicles.

Another responsibility of the *XM-1* Project Manager is tank gun ammunition development, and we have had a great deal of activity and a great deal of success in that area. There are five rounds in the evolution of ammunition for the 105-mm main gun—the *M-735, XM-774, XM-833, XM-797,* and *XM-815*. The *M-735* is a long-rod penetrator kinetic energy round that has been fielded to Europe and it will be followed by a new generation kinetic energy round using a depleted uranium penetrator. Even further in the future are the *XM-815* HEAT round and the *XM-833* modern technology round. Currently, the *XM-797* training round is of the highest priority. This round will have the same appearance as that of the service round and will be accurate out to 3,000 meters, after which it will drop dead at 8,000 meters. Those characteristics will permit its use in the very restrictive training areas that we must live with. Another facet of ammunition development involves the decision to adapt the German 120-mm main gun to the *XM-1* in August 1984. The big task here is the technical translation of the Technical Data Packets for the rounds and establishment of a production base for them in the U.S.

There has been considerable discussion as to whether the Army was in favor of the 120-mm gun or whether or not it was forced to accept it. Recently, General John W. Vessey, Vice Chief of Staff, U.S. Army, in an appearance before a Congressional investigating committee, stated that the Army needs the 120-mm gun to kill what might be on the battlefield in the mid-eighties. He said the fact that it is interoperable with the Germans is a bonus, but that isn't the primary reason we need the gun. That left no doubt in anyone's mind as to whether we want the gun or not. By August 1984, we should have the ammunition base established and we will have tested six pilot models of *XM-1s* mounting the 120-mm gun to make sure that all the user concerns, including fightability, are not compromised when we go to the 120-mm system.

* * * * * * *

During the question and answer period following the briefing, General Babers said that the matter of greater fuel consumption and the related shortage of transportation for fuel was being studied as is the need for the tank to accept fuel at a faster rate. He also noted the need for an armored rearm/refuel vehicle but that the issue was dead for the time being. He added, however, that units at Fort Hood are getting more fuel transporters because they cannot move enough fuel, even for the *M-60,* with organic assets.

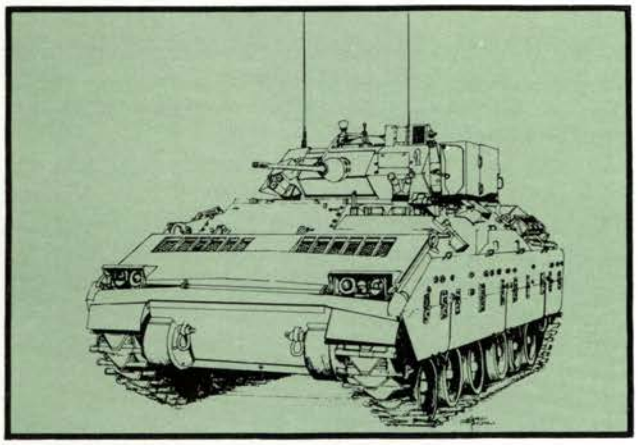
In answer to a question concerning ammunition stowage and the quantity of the basic load, General Babers acknowledged that the *XM-1* carries less rounds than the *M-60*—55 as opposed to 63—and that the tank,

as it is now configured, would carry only 40 rounds of 120-mm ammunition. He pointed out that a comprehensive evaluation, developmental testing, and operational testing will be conducted before 1984 to solve problems related to ammunition basic loads, stowage, and resupply.

In answer to a question concerning operations in an NBC environment, General Lynch, Armor Center Commander, stated that the matter of protection from chemicals and radiation is being studied and that the Armor Center's position is that it should take the form of a hybrid over-pressurization system. He noted that among other problems, there is the one of having a crewman put overgarments on over the combat vehicle crewman's uniform, don a gas mask, and operate efficiently for long periods in a turret where the temperature may reach 140 degrees.

* * * * * * *

The briefing concluded with a film clip of the *XM-1* in operation, including a demonstration of the ability to fire on the move with precision.



M-2/3 Update

BG Philip L. Bolte
M-2/3 Project Manager

This article contains only part of Brigadier General Bolte's presentation. In the first half of his briefing, he reviewed the development, testing, and operating characteristics of the Infantry and Cavalry Fighting Vehicles (IFV/CFV) which have now been classified type standard as the M-2 and M-3.

The following is a condensed version of the remainder of the briefing.

The first production models of the IFV/CFV will be delivered in May 1981, with an initial operational capability in the Continental United States in 1982 and in Germany in 1983. When fielding is mentioned, invariably questions are asked about training devices. In that regard, you can't complete the development of your test equipment and training devices, and write your manuals until you know what it is that you are training on. It doesn't happen until you are ready for production because there are a lot of changes between the acquisition of prototype vehicles and the fielding of production models. All project managers are faced with how to compromise on the problem of getting material in the field on schedule and still making sure that it is maintainable and trainable. But the ideal situation of having equipment and its training and maintenance material arrive simultaneously cannot be achieved unless the vehicle or weapon system is produced and parked in a motor pool for two years while the rest of the development is completed.

So much for that. Now back to the fielding schedule and distribution of the fighting vehicles. We will buy 100 vehicles in 1980 and build up to a production rate of 50 vehicles per month during the second year. After that, production will continue to build up to 90 vehicles per month in 1984.

As the fighting vehicles come into the inventory, they will be distributed to mechanized infantry battalions, armored cavalry squadrons, and scout platoons of the mechanized infantry and armor battalions. The mechanized infantry battalions will have 41 IFVs—four per platoon and one in the company headquarters. In the armored cavalry squadron the CFVs will be teamed with *XM-1s,* with five *M-3s* going to each reconnaissance platoon. Rounding out the distribution of the CFVs will be the six authorized for the scout platoon of each mechanized infantry and armor battalion.

Since the fighting vehicles will not replace all of the *M-113s*, and their derivative forms, found in the combat battalions, it is obvious that the *M-113* will be around for years to come.

IFVs and CFVs will be issued based on requisitions from the using unit and will be accompanied by any ancillary equipment requested by the unit, including the authorized stockage list and prescribed load list of spare parts. In some instances, the using units will be able to transfer some items from their *M-113* to the fighting vehicles—radios for example. Should the using unit request additional items of equipment, the readiness commands will make the determination as to whether the additional items are required. If the additional items are required, and are not standard issue, the readiness commands will procure them and provide them to the contractor as government furnished material. The contractor will then include the additional items in the assembly of the vehicle before it is issued to the using unit.

When the IFVs and CFVs are issued, fielding teams will be provided to the using unit to assist in training the unit's personnel to use and maintain an all-new, very complicated vehicle and weapons system. The first of the new fighting vehicles will be issued to one of those

battalions stationed at Fort Hood, TX in 1982.

The maintenance concept for the vehicle is geared to the automotive, armament, and missile components of the vehicles. At the organizational level, maintenance of the nonmissile parts of the vehicles, particularly those things in the turret, will be limited to replacing modules. At the direct support (DS) level, modules will be repaired and components will be replaced. General support (GS) facilities will repair components and replace piece parts, while depots will perform major overhauls.

The missile system will receive basically no organizational maintenance but will be serviced by contact support teams from the direct support maintenance units that are authorized to replace modules and components. During initial fielding, no GS-level maintenance will be accomplished at the depots. However, when the system is completely fielded and it has been determined what maintenance can be performed at the GS-level and what number of spare parts are required, some of the maintenance load will be shifted to GS maintenance units.

Test equipment to support the maintenance effort include the built-in equipment on the vehicle, the Simplified Testing Equipment—Transitional (STE-T), the Direct Support Electrical System Test Set (DSESTS), TOW Verification Test Set (TVTS), and the Equipment Quality Universal Automatic Test Equipment (EQUATE). The built-in equipment will be used by operators, STE-T will be used on nonmissile components, TVTS will be used by contact support teams and at DS-level, as will DSTESTS. The EQUATE system has been selected by DARCOM as a common maintenance test set for all components and will be used at depot level.

Training devices development is lagging behind vehicle development, but basically there will be a family of three: a turret maintenance trainer; a conduct-of-fire trainer (COFT), and a driver trainer. These are being developed along with training devices for the *XM-1* so that there is as much similarity as possible in these units. This will simplify their use for individual, unit and institutional training and it will also simplify the maintenance of the trainers.

In the meantime, interim devices will be used. Instead of a turret maintenance trainer, major turret components will be used for institutional training and the vehicles themselves will be used for this type of training in the units. Simplified COFTs are available for gunnery training as are subcaliber and light-source firing devices. However, work is continuing to develop even better gunnery training equipment. As for driver training, the vehicle itself will have to be used until a driving simulator is fielded.

Another facet of the fighting vehicle program is the development of derivative vehicles based on the chassis and automotive components of the *M-2/3*. One such vehicle has been designed as a mount for the Multiple Launch Rocket System and it is ready for production. It will use the same engine, power train, and suspension as the *M-2/3* and has the possibility for configuration as a resupply vehicle, an armored forward area rearm vehicle, and as an ambulance.

As with the *XM-1*, troop testing of the IFVs and CFVs will be extensive and a Force Development Test and Evaluation of the CFV is underway at Fort Knox where Troop E, 2-6th Cavalry will drive, fire, and maintain five vehicles during the next several months.

In conclusion, and in answer to a question, it has been proposed that the IFV be named the *Bradley* and the CFV the *Devers*, but a decision to do so has not been made.

AAH Update

BG Edward M. Browne
AAH Project Manager

For thousands of years the horse was used to expand the mobility on the battlefield. Men such as Genghis Khan and George Custer made history with their employment of the cavalry. With the advent of the internal combustion engine, the horse was pushed into obsolescence and the jeep and the tank were used in similar roles. Later, with the advent of the turbine engine, the helicopter came into its own in Vietnam.

Now, the Army has taken advantage of the most recent aviation technology and is developing an even more lethal helicopter—the Advanced Attack Helicopter or AAH. It is designed specifically for day or night antiarmor missions under adverse weather conditions. It will also have the ability to fight, survive, and live with the troops in the frontline battlefield environment.

The need for it is obvious. The AAH will face a Threat armored force that is numerically superior and that is growing more sophisticated. The AAH will be a team player and enhance the overall efficiency of the combined arms team. It will possess a unique night

precision attack capability, and its firepower standoff capability will reduce losses while increasing the number of enemy tanks killed.

The potential requirements for operations in a Middle East scenario have increased significantly over this time last year because of the Soviet operations in Afghanistan. The AAH has been designated for day and night operations as well as marginal weather at altitudes and temperatures encountered in this region. Present plans are to build production up to eight AAHs per month. Meanwhile, the Soviets are reportedly producing 15 *Hind Ds* a month, and have an inventory of over 400.

Requirements

The minimum mission requirement at 4,000 feet and 95° F specifies a speed of 415 knots, a rate of climb of 450 feet per minute, and mission endurance of 1.83 hours, all while carrying an ordnance load of 8 HELLFIRE missiles and 320 rounds of 30-mm ammunition.

The AAH also has many survivability features built in, including protection against 12.7- and 23-mm weapons, and active and passive infrared countermeasures.

In comparison with the antiarmor mission in the Mideast, the cooler temperatures and lower altitudes in Europe allow the AAH to carry up to 8 HELLFIRE missiles, 654 rounds of 30-mm ammunition, and 38 2.75-in rockets in various configurations, with an endurance of 2½ hours (chart 1).

Progress

We are currently in Phase 2 of the program which began in December 1976. Phase 1 involved the flyoff between Bell and Hughes Helicopters prototypes, with the source selection board choosing Hughes to proceed into full-scale engineering development. Currently, the Target Acquisition Designation System (TADS) and the Pilot Night Vision System (PNVS) are under development.

Operational Test II, which is a major milestone prior to the selection decision, is scheduled for June, July, and August 1981.

The HELLFIRE began its operational test in May 1980 at Hunter Ligget, CA using surrogate aircraft. Unanswered issues from the HELLFIRE test will be addressed during the AAH's OT II.

Phase 2 of the program includes the following items that have to be accomplished:

- Modify Phase I aircraft.
- Fabricate three new prototypes.
- Develop TADS/PNVS.
- Develop 30-mm chain gun.
- Integrate mission equipment.
- Conduct development test.
- Initiate training program.
- Establish logistical support.
- Conduct Operational Test II.
- Get production approval.

HELLFIRE

The Project Manager's Office has spearheaded firing the HELLFIRE missile from the attack helicopter, and results have exceeded requirements. Thirteen HELLFIREs have been fired from the AAH with most of the firings being successful. The first day and night firings of the HELLFIRE against a tactical target occurred on 6 and 7 May. Both shots resulted in direct hits. During the 13 firings, only two problems have occurred with the missiles. Both were minor in nature, and the causes have been identified.

Modifications

A modification was made on the AAH in October 1979

MISSION	ORDNANCE			PERFORMANCE VROC	CRUISE	ENDURANCE
ANTIARMOR (DEFENSE) MIDEAST PRIMARY 4000'/95°F	4 HF	320 RDS	4 HF	580 FPM	145 KTS	1.83 HRS
EUROPE ALTERNATE 2000'/70°F	8 HF	995 RDS	8 HF	450 FPM	150 KTS	2.5 HRS
COVERING FORCE (AIR CAV) MIDEAST ALTERNATE 4000'/95°F	4 HF	536 RDS	4 HF	450 FPM	145 KTS	1.83 HRS
EUROPE ALTERNATE 2000'/70°F	4 HF 19 RKTS	654 RDS	4 HF 19 RKTS	450 FPM	150 KTS	2.5 HRS
AIRMOBILE ESCORT MIDEAST ALTERNATE 4000'/95°F	19 RKTS	195 RDS	19 RKTS	450 FPM	145 KTS	1.83 HRS
EUROPE ALTERNATE 2000'/70°F	38 RKTS	313 RDS	38 RKTS	450 FPM	150 KTS	2.5 HRS

HF - HELLFIRE RKTS - Rockets RDS - Rounds VROC - Vertical Rate of Climb
FPM - Feet per Minute KTS - Knots HRS - Hours

which changed its configuration from a T-tail by adding a stabilator. This change was made because of handling problems, especially in sideward flight. All tests indicated that the stabilators have solved the problems and will add to the agility and maneuverability of the aircraft.

Training Challenges

There are many new items of equipment on the AAH which will require intensive training for employment on the modern battlefield. These include the TADS/PNVS, imagery, sensors, the helmet sight, new controls, and weapons systems.

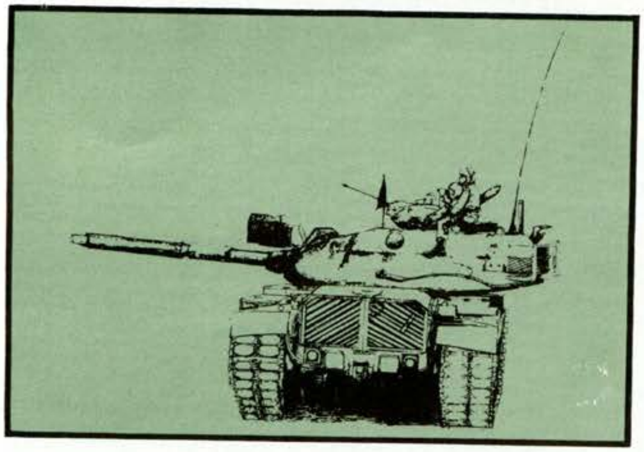
The pilot and copilot/gunner need to be trained in basic aircraft operations, use of the TADS/PNVS; integrated helmet and display sight system, the armament system, including the 2.75-in rockets; the 30-mm gun and HELLFIRE missiles; the fault detection/location system; and the navigation, communication, and survivability equipment.

To accomplish this training, a developmental training center was established at Yuma Proving Ground. Through the use of surrogate trainers and coordinated effort with the contractor, a nucleus of officers, warrant officers, and enlisted men have been trained to train the pilots and maintenance personnel who will be required to bridge the gap through developmental and operational testing. This nucleus will then become the basis on which to build and transfer the training effort to the TRADOC community.

Skills

There are no new MOSs required for the AAH. There is, however, one area in which there will have to be a constant update—that is in MOS 35B—which, due to the use of extensive automatic test equipment, will require a revised program of instruction.

We can't match our enemies man for man, gun for gun, or tank for tank. The addition of the AAH to the Combined Arms Team, combined with the proper tactics, training, and logistical support, will enhance the combat power of that team and add a lethal capability we have not had in the past.



M-60A3 Update

COL Paul Bayruns
M-60 Project Manager

The *M-60A3* Project Manager's Office is responsible for the entire *M-60* series fleet and a few peripherals such as the combat engineer vehicle and armored vehicle launched bridge.

For those who have not had an opportunity to see an *M-60A3*, it looks very much like the *M-60A1*. Distinguishing features are the thermal shield on the gun tube, the wind sensor on the top rear of the turret, and the shield over the right rangefinder bubble where the laser was installed.

Last year, we had completed the new equipment training in Europe, had our fielding team present, the tanks were on the ground, and we were waiting for the troops to arrive.

We fielded the first battalion in June of 1979, and we have been fielding more ever since—but not at the rate that we wanted to. We have had difficulty in getting the fire control equipment—the laser and the computer—from our contractors at the rate we had originally wanted. But we are getting over our problems, and we are getting the delivery rate up.

At the end of March and the beginning of April, we went to Europe and talked with the battalion and brigade commanders of the units that have the *M-60A3*. We visited one of the units that was being deployed at that time. The troops are enthusiastic about the *A3*—it shoots well, the hardware is standing up, and the troops can maintain it.

There's a lesson to be learned here. There was a positive attitude when throughout the entire user/developer community. When we sent the *A3* to the field, the troops received good training at Vilseck, they were supported well by DARCOM, and they went home satisfied. It's not just the guy who's selling the hardware telling you it's good. I think you'll hear the same stories from the men who have the tanks.

Today, a battalion commander is seeing a 12-13 percent turnover of people, which means that when he goes back to Graf every six months, almost two-thirds of his tank crews are not the same guys that went down Range 42 the last time they were there. That's the big challenge from a training aspect, particularly when you are talking about the *M-60A3* with the laser rangefinder and its associated safety problems.

Thermal Sight

We have sent several of *M-60A3s* equipped with the

tank thermal sight to USAREUR. The troops know the capability of the sight, and they want it.

The thermal sight is made up of the head assembly; the gunner's viewer; the commander's display, which is nothing more than a light pipe that sends an image from the gunner's sight to the commander; three-inch binoculars, and associated cabling. The electronics unit fits into the aperture at the top of the turret.

The gunner's station has both a thermal channel and a regular daylight channel. The thermal sight distinguishes between objects of different temperatures and displays the difference visually. The technology involved in the *M-60A3's* thermal sight is the same as used in the AAH's Forward-Looking Infrared and the *XM-1* and its thermal imaging system.

Crewmen will have to be trained to use the sight to be able to determine what the blips in the sight are, so that he can determine whether to fire, and with what ammunition.

One of the other devices we are working on is the vehicle engine exhaust smoke system. It is very similar to a foreign army's equipment. When you see something good, don't be too proud to adopt it.

The hardware is very simple. It consists of some plumbing put on the engine by Teledyne when it leaves the plant. Fuel is sprayed into the exhaust manifold, where it is shot into the atmosphere. It is not very complicated or expensive. A field program is underway in Europe to fit the system to existing tanks and all new tanks are fitted with it.

Fire Extinguisher

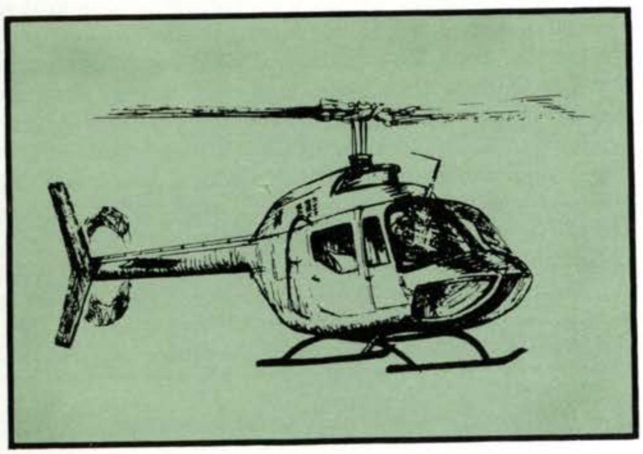
The automatic Halon fire extinguisher system for the *M-60* series is very similar to that of the *XM-1*. This system, which replaces the existing manual system, uses sensors to detect heat and light from a fire and automatically releases the Halon fire suppressant.

Work continues on developing a heading reference unit. Currently, two systems are under study, a magnetic indicator and a gyrocompass. Testing is scheduled to be completed later this year, and a decision made.

Production on the *M-60* series tanks is beginning to wind down at the Detroit Tank Plant. The last *M-60A3* for the US Army is scheduled off the production line in January of 1982. The production line will continue in operation for a time after that date, however, while tanks are built for foreign military sales (FMS). The last *M-60A1s* were completed in May of 1980 when the last 14 were delivered to the US Marine Corps.

The Army, in addition to receiving new *M-60A3s* from the tank platoon, will also be receiving *A3s* made by upgrading *M-60A1s* at depots at Mainz, Germany and Anniston Army Arsenal, Anniston, AL.

Today at Detroit, we are producing components for the *XM-1*, and there will be a phaseover to the *XM-1*, depending on how long the FMS sales continue.



Combat Aviation Training Strategies for the 1980's

BG Carl H. McNair
Deputy Commander,
US Aviation Center

Aviation soldiers must be fully prepared and ready to fly their first combat mission from the day they complete their training. They must report to their units with the skills that are essential for combat. Furthermore, junior officers must not only be leaders, but they must also know how to train their sections and platoons and manage that training and related materiel resources.

To insure that Army aviators are trained to meet the Threat as members of the combined arms team, the U.S. Army Aviation Center, Fort Rucker, AL, is developing a total Army aviation training strategy for the 1980's. This strategy stems from a study that was based on the experience of field commanders, lessons learned during RED FLAG Exercises and Joint Air Attack Tests, interviews with subject matter experts in the Aviation Center's academic departments, and responses from students in the Senior and Advanced Warrant Officer Courses.

The input from these sources was then placed in four categories—Threat, equipment, training, and perceptions of the field environment. Eight major training problem areas concerning Army aviation training were identified by field commanders:

- Restrictions on training.
- Training the trainer.
- Tactical instruments.
- Doctrine/tactics/publications.
- Maintenance.
- Institutional training.
- Unit training.
- ARTEP.

These problems have existed for some time and still require resolution. That is where the expertise must be brought to bear and we plan to address each of these problem areas with a very direct four-point strategy—identify the problem; analyze current training; identify

the voids and shortfalls; and develop appropriate training programs. The first three steps have been accomplished. Examples of the efforts being made in training development follow.

An analysis of the basic initial entry training for rotary wing aircraft revealed that the program could be improved by increasing the combat training and by refining the methods for measuring student proficiency. The study also showed that training cost could be reduced by husbanding resources in one phase of training and reapplying them to areas of combat training. The initial entry student will be introduced to tactical training during the first 50 hours of the course—much earlier than before. Initial entry students will also be required to qualify in the use of night vision goggles. A full scale tactical exercise will be conducted at the end of the combat training phase to give the student a better feel for the complexity of aviation operations. Nuclear, biological, and chemical warfare training has been greatly increased.

"Every student in the Cobra program can 'fire' an unlimited number of TOW missiles, rockets, and cannon rounds at practically no cost."

A student's proficiency will be determined by testing him in all critical tasks, and at random in other tasks as well. Therefore, to insure total success, the student must be fully trained to proficiency in all tactical areas.

Equally as important as improving training programs is the need to reduce training costs in these days of constrained resources and energy resources. At Fort Rucker, aircraft maintenance and fuel consumption are being reduced by making greater use of simulators and by transferring 20 flight hours of the aeroscout training from the *UH-1* to the *OH-58,* which is less expensive to operate. An added benefit of this cost reduction is a more proficient scout pilot.

Collectively, the proposals just discussed will provide a 50 percent increase in combat readiness training at a reduced cost.

In another area of combat training, a three phase, comprehensive program is being developed for attack helicopter pilots to replace the multiple courses for the *AH-1G* and TOW *Cobra* which have not produced fully qualified combat aviators. The first phase will be a 6-week, 4-day segment with 39 dual flight hours and 3.8 flight simulator hours. Phase I will include 15.8 hours of night training. The 2-week Phase II, which is proposed for early 1981, will further increase the aviator's training in night combat skills by providing 10 night flying hours.

Phase III is planned to be a 2-week segment that will provide total tactical team training and aeroscout operations, with teams operating in a simulated Threat environment. It is in Phase III that individual skills will be fine-tuned to produce an aviator who is fully trained and ready to fly and fight as a member of an aeroscout-attack team that can shoot, hit, and survive.

A spinoff of the attack helicopter course may well be a multitrack training program for the initial entry student. Initially, a triple track program emerged by adding the attack combat skills qualification course to the program, thereby providing the capability for training students as either utility, scout, or attack helicopter pilots. Further in the future, a multitrack program would permit initial entry rotary wing students to train in a number of different systems but with emphasis on combat skills throughout the course.

As mentioned earlier, the aim of the Aviation Center is to improve training while reducing training costs. This can be done by using simulators that enhance economy, efficiency, productivity, and overall combat readiness. For example, in the *AH-1* courses, flight hours were traded for simulator hours on a 1 for 1 basis and reduced flying hours from 25 to 18.4. The decrease in *Cobra* flying hours more than pays for simulator operation and it is possible to qualify students in aerial gunnery rather than simply familiarizing them with the weapons systems. Every student in the *Cobra* program can "fire" an unlimited number of TOW missiles, rockets, and cannon rounds at practically no cost. Previously, each *class* was allotted only one live TOW missile, which the honor graduate had the privilege of firing. He never missed because his classmates would never have forgiven him.

Simulators are available, or will become available, for other types of aircraft and for maintenance activities. A flight simulator for the *CH-47 Chinook* helicopter is in the advanced state of development and will be integrated into the *CH-47* qualification course. This simulator, like that for the *Cobra,* uses a camera module and terrain board to display discreet visual cues to elicit pilot performance. A full range of flight conditions can be replicated, including flight at altitude; low level; and nap-of-the-earth; day or night; and under reduced visibility and instrument conditions.

An even more sophisticated simulator is under development for the *UH-60 Blackhawk* and should be available for an Operational Test II in September 1981. An *AH-64* simulator should be available for test and training concurrent with the initial deployment of the aircraft.

"Looking into the future, an aviator could ultimately be trained in a totally simulated combat environment, under Threat conditions."

On a smaller scale, but equally important to the aviator training, are devices that compliment and enhance the program. These include the Multiple, Integrated, Laser Engagement System (MILES); Air-ground Engagement Simulator (AGES); and maintenance and instrument flying trainers.

AGES can be used in conjunction with the ground version of MILES, and it will be upgraded to provide gunnery proficiency training and will permit aviation and ground combat forces to conduct real-time casualty assessments during combined arms field training. Another gunnery training device, the Helicopter In-

stalled Television Monitor/Recorder (HITMORE) is an on-board system that provides the instructor pilot with a real-time view of what the gunner sees through his telescopic sight, and the capability for post-flight analysis of live and dry-fire engagements.

In the maintenance area, trainers and simulators are available for providing realistic, economical training for mechanics and aviators in aircraft systems and power plants. These devices not only assist students in understanding complicated mechanical, electrical, and hydraulic systems but they actually free aircraft from being used as static training aids. These devices are driven by minicomputers that permit the operator to create every imaginable system fault, including faults that could not be replicated on an actual aircraft without irreparable damage.

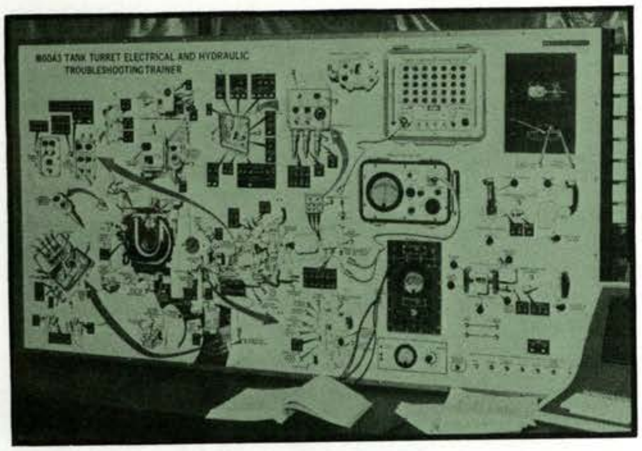
Simulators and trainers are also available for creating a realistic threat antiaircraft defense environment. The ground radar emitter trainer, for example, creates a signature identical to that of the *ZSU-23-4* and other Soviet radar-directed air defense systems.

Another simulator that is being sought for aviator training is an air traffic control trainer that will transfer air control problems from the Aviation Center computer over telephone lines to simulated radar scopes at selected fixed and tactical locations throughout the continental U.S.

Looking further into the future, an aviator could ultimately be trained in a totally simulated combat environment, under Threat conditions, while employing AGES to score his successes and failures in real time. In other words, he would fight that first battle in simulation before hostilities begin.

Properly implemented and supported, aviation training strategies will insure that combat aviation soldiers of the eighties will always be prepared to perform the key tasks on future battlefields to shoot, hit, and survive in the first and last battles of the next war.

The remainder of General McNair's briefing pertained to the establishment of the Army aviation career field—Speciality 15—and the effects of RETO on the management of that speciality. A full discussion of RETO and its impact on the entire officer corps appears elsewhere in this issue. Ed.



Training Device Technology

A series of displays of training devices and range demonstrations by 21 manufacturers from the U.S., Canada, and Europe was a feature of this year's Armor Conference. The devices ranged from remotely-triggered targets and a short-range Target-Practice, Discarding sabot (TPDS) round to gunnery and fire control simulators and complete weapons simulations systems using lasers that allow realistic combat engagements.

Sperry Systems Management of the U.S. exhibited scaled infantry and armor targets in one-fifth and full scale and fixed, moving, and liftup designs. The company is also working on an *XM-1* tank driver simulator, which is in the final stages of development. Delivery of the first system to Fort Knox is scheduled for October 1980. It will consist of an instructor station and five trainee stations, and will allow the instructor to introduce various scenarios that might arise while driving a tank.

ABA Electromechanical, another U.S. company, also exhibited a target system with infantry and armor popup and movable targets, and a new moving target system using a monorail guide. ABA also exhibited a Hostile Fire Cartridge Simulator, which uses a series of cartridges to simulate the sight and sound of a gun firing.

The Detroit Bullet Trap Company exhibited their *DBT-18BF* infantry and *DBT-18SC* tank targets, which are radio-controlled popup targets that drop to indicate a hit, and automatically return upright after a delay. The company also exhibited a small-arms fire simulator.

Schermuly-Graviner, of the United Kingdom, displayed products from their line of pyrotechnics, including hand-thrown smoke and screening grenades; vehicle-discharged smoke grenades; free-flight rockets carrying flares, chaff, or a parachute target; and a line-throwing rocket capable of throwing a line up to 250 meters over a ravine, up a cliff, or anywhere else a line is needed across an obstacle. This rocket-thrown line may have some application in helicopter defense.

Hostile Fire Simulation

SAAB-Scandia of Sweden exhibited a line of remotely-controlled popup targets with simulators for hostile fire. They also have laser-based firing simulators and target simulators, including a target that simulates the thermal image of an actual vehicle. The company has also developed an artillery fire control simulator that allows fire control personnel to be trained on an indoor range.

McDonald-Douglas Corporation of the U.S. demon-

strated a hostile fire simulator, which uses flammable gases to create the flash, bang, and smoke of a gun firing, rather than using pyrotechnics.

The *Audi-Pointer*®, manufactured by Ridgeway Electronics of the U.S. is an electronic training system that provides audio and visual information simultaneously. The system uses audio cassettes prepared by the instructor, and locally printed or drawn illustrations which are placed over the *Audi-Pointer's*® screen. One track of the cassette provides the audio information, while the other track contains cues for the visual display of a pointer that can trace circuiting or designate an item that is being discussed.

A Projected Map Display (PMD) for tactical aircraft and helicopters was demonstrated by Computing Devices Company, a Canadian company of Control Data Corporation.

The system provides the pilot with a full-color projection of topographical maps or aeronautical charts in a variety of scales. It also features a digital display of the aircraft's location in latitude and longitude along with heading being flown.

Any standard map can be used, and is photographed into a series of overlapping areas on a roll of standard 35-mm film. This film is then loaded into a cassette inside the machine, and the system is ready to go.

A *Spinning Tubular Projectile* (STUP) was exhibited and demonstrated by Space Research Corporation of Canada. The round, according to the manufacturer, ballistically simulates armor-piercing, discarding-sabot (APDS) and armor-piercing, fin-stabilized, discarding sabot (APFSDS) rounds at ranges to 2,400 meters, while having a maximum range of less than 8 km and a short ricochet range.

Gunnery Simulators

Giravions-Dorand Industries of France displayed several gunnery simulators that are fitted directly onto tanks with different fire control systems. The *DX. 150* simulator, in service with the French Army, is a gunnery training simulator that allows tactical training to take place in the field under tactical conditions. Modules are mounted over the outside of the sights and project a simulated target through the optics, and then projects the trajectory of the round fired.

Another version, the *DX. 154*, is designed for tanks using the *M. 586* automatic fire control systems. Giravions-Dorand also makes simulators for other weapon systems, including a *Milan* antitank missile simulator..

Sintro of Switzerland exhibited the *ELSAP 2000*, a tank fire simulator developed in conjunction with the Swiss Army. The system is installed in a modified *Pz68* turret, and provides simulated round detonation, barrel recoil, and the associated vibrations of an actual firing.

Full crew participation is required. The commander must detect targets and give the fire commands. The gunner then engages a fixed or moving target, which can be shown as being any distance within the effective range of the gun, with varying visibility, surroundings. The loader has to load the main gun with the correct round, which is of appropriate size and weight. The projectile of the training round is ejected laterally from the gun into a box outside the turret, and upon firing, the empty casing is ejected normally from the gun.

ELSAP 2000 uses a terrain model with fixed and moving targets that is able to simulate a wide range of threat situations. The entire system of four turrets is controlled from an instructor's station, where data from each turret can be recorded for later use.

SIMFICS

Solartron from the United Kingdom, exhibited the SIMFICS system, which is a derivate of their SIMFIRE system. SIMFICS uses a new transmitter mounted in the gun tube, and a microprocessor to eliminate many of the manual settings of SIMFIRE. It is currently in production for the British Army.

The company has also developed a simulation trainer for the *Milan* missile that could also be applied to similar systems such as *Dragon* and TOW. A third system exhibited was *Moduflash*, a multiple disposable block pyrotechnic system for simulating single or multiple shot firings.

The Educational Computer Company of the U.S. displayed training simulators to teach mechanics troubleshooting and a knowledge of equipment. The systems use a common computer and various simulations boards to represent specific systems, such as the electrical and hydraulic systems in the *M-60* series tank. A hands-on, full-size turret maintenance trainer for the *XM-1* is being developed for use at Fort Knox. It will assist in teaching removal and replacement skills. Further down the road are similar trainers for the Fighting Vehicle Systems.

Fairchild Camera and Instrument Corporation exhibited the Helicopter Installed Television Recorder (HITMORE), designated the *AN/AXQ-15*, and the Cockpit Television Sensor, a similar system for fixed-wing aircraft.

HITMORE, as installed in an attack helicopter, uses a miniature charge-coupled device (CCD) TV camera, a monitor for the instructor pilot, and a videotape recorder. It allows real-time monitoring of the gunner's aim and simulated TOW firings, and a playback after the mission. In addition, the system also can be used for reconnaissance, damage assessment, and as a landing aid.

Another application of the CCD TV camera is for an artillery-launched battlefield observation system. A camera and transmitter replace the illuminant in a *M-485A2* 155-mm artillery round, and is fired over the battlefield from up to 14 km away. Pictures are transmitted to a mobile receiving station, where they provide about two to three minutes of imagery. The field of view from 2,000 feet is about 1,000 by 750 feet, with a five-foot resolution, with the swing from the parachute doubling this area.

Talissi

The Tactical Light Shot Simulation system (Talissi), manufactured by the firm of Kurt Eichweber of Germany, simulates ballistic or guided weapons, directly aimed or sight-controlled. It can be used for tactical training and testing; gunnery training, either against moving targets or in a dual situation; and in

realistic battlefield simulations with the appropriate weapons mix.

Smoke and blast are simulated with pyrotechnics, as are enemy hits. Umpires are equipped with a rifle that allows them to simulate the effect of nonsimulated weapons, such as artillery, or to return a killed system or player to the battle.

MILES

The Multiple Integrated Laser Engagement System (MILES) was exhibited by Xerox Electro Optical Division of the U.S. It uses a battery-operated, eye-safe laser to simulate live fire from a direct fire weapon. The transmitters are light and can be easily attached or removed. Weapons signatures are simulated by using blank cartridges, and the transmitters have the same range as the weapon.

Sensors mounted on troops and vehicles receive coded pulses from firing weapons, and determine the potential for damage, i.e., a rifle cannot kill a tank. The sensors also determine the probability of kill; determine whether it was a near miss, a hit or a kill; and provide visual and audible signals of the results. This system is in use with the U.S. Army.

TALAFIT

Bendix of Canada exhibited the Tank Level Aiming and Firing Trainer (TALAFIT), which is designed to teach a gunner the initial skills of tank gunnery—target acquisition, rangefinding, tracking, and firing. There are two versions of the system, a classroom gunner's station and a tank system, which mounts directly on the tank and allows the gunner to sit at his controls and see a simulated battlefield through his sights.

Various targets and conditions can be presented and are selected by the instructor, as are parameters governing the exercise, including time for the engagement, status of stabilization, and motion of the firing tank. The system determines whether a hit was scored within the parameters set. If not, the screen goes black, indicating the target has fired back. The system is available for *Leopard* tanks, and a system for the *M-60* series tanks is under study. It is currently in service with the Belgium, Canadian and Australian armies.

Summaries of Other Conference Briefings

Other speakers at the Armor Conference included Major General Maxwell Truman, Commanding General of the U.S. Army Recruiting Command (USAREC); Colonel Larry R. Williams, representing the U.S. Marine Corps; and Command Sergeant Major Thomas J. Piasecki, Command Sergeant Major of the U.S. Army Sergeants Major Academy.

According to General Truman, USAREC is optimistic about meeting this year's manpower goals. As of 7 May, the armor and cavalry military occupation specialty Career Management Field 19 was 90 percent filled. Recruiting for the Army Reserve, which USAREC assumed responsibility for this year also was proceeding well, with recruiting already over the goal for the year. He pointed out that the goal set for the Reserves was not that of bringing them to 100 percent strength, but was a force level dictated by funding constraints.

He acknowledged some problems in recruiting high school graduates, commenting that high school graduates did not walk into recruiting stations to enlist—recruiters have to work for them. On the matter of pay and benefits, he said that an all-volunteer force is recruitable as long as the military is willing to compete in the economic marketplace. To illustrate this, he pointed out that in Fiscal Year 1971, an E-1 received 111 percent of the federal minimum wage, while in FY-79 that figure had dropped to 84 percent of the minimum wage. During the same time, GI Bill educational benefits were reduced, while low-interest Department of Health Education and Welfare loans were up, making it harder to recruit the high school graduate.

Colonel Williams pointed out that Marine Corps training differs from Army training because of different perceptions and different roles and missions. The Marines are basically naval in character, and are an amphibious force. They maintain forces around the world, and have a high training tempo.

He noted that the Marines have been conducting combined arms operations for many years, because of the nature of their missions. He also pointed out that aviation units are attached directly to combat elements to provide both fixed and rotary wing assets to the ground commander.

The Marines conduct much of their combined arms training at the Marine Corps Air Ground Combat Center at Twenty-nine Palms, CA, where they can use all of their vehicles in a combined arms environment and use live fire. Every Marine battalion is slated to go there every three years.

One other area touched on was the Marines' Mobile Protected Weapons System (MPWS), a system designed to provide armor protected direct fire support to amphibious assault forces. This system is beginning development, with introduction to the force projected for 1988.

The Marine Corps is also looking at off-the-shelf lightly-armored vehicles.

CSM Piasecki outlined the program of instruction at the Sergeants Major Academy, which is the top level of the Noncommissioned Officer Educational System. The course enhances senior NCO's skills in leadership, management, discipline, human relations, and training.

NCOs are considered for the Academy after they have a year in grade as an E-8, and they can be considered for four years. They must not have more than 23 years service when selected (waived for reservists), and they must agree to serve at least 19 months after graduation.

The course is based on group instruction, and also has a guest speaker program. An exchange program with the Army War College and seminars round out the course.

DOES ARMOR HAVE A "HO HUM" ATTITUDE?

by General Donn A. Starry

The following is a transcription of an after-dinner address presented by General Starry during the 1980 Annual Armor Conference, Fort Knox, KY.

Armor conferences are usually described by outsiders as examples of a mutual admiration society, a corporate closed mind, or an association for the preservation of obsolescence. Obviously, insiders have a different view. However, as I observe Armor today from my vantage point, there is an air of complacency—one officer called it a "Ho Hum" attitude—about us that is alarming and I believe out of character. So, let me talk about that a little, just to get your attention and keep your thoughts moving. If I make you angry, so much the better—perhaps you'll accept the challenge and do something instead of resting on your laurels.

First, we need to be reminded that Armor was built on ideas formulated by mavericks—they were the professional visionaries and malcontents of the 1930's. They refused to be "Ho Hum"—they strove to develop new doctrines for war and to become excellent in the application of those doctrines. They believed that a relatively small, highly-trained force could defy the tribal wisdom about ways to win wars.

Actions on both sides of World War II battlefields testified to the wisdom of their judgments. What won in that war was not always calculated in terms of better weapons, more supplies, or more equipment.

Indeed, the history of war testifies that battle outcomes are most often determined by factors other than a disparity in numbers of people, numbers, and types of weapons, or force ratios. All the counting you want to do cannot explain Cannae, Thermoplyae, Alexander's Macedonian Army, Napoleon's Grand Army, Bastogne or Inchon.

On the contrary, history tells us that the outcome of battles most frequently follows from the courage of soldiers, the quality of leadership, and the excellence of training. I've said that before; I didn't invent it—it's apparent in any study of the history of battle. Battle analysis tells us that well-trained soldiers in well-trained teams and crews in well-trained and well-led units win far more often than not.

What is it that wins? How do we define it? How do we get it? How do we know when we have it? Excellence comes from two things:

- Initiative of leaders in training.
- Willingness of leaders to take the initiative in operations.

"Leaders must develop and share a common set of battlefield values with their soldiers."

Both of these are well-established fundamentals of mobile warfare. In training and operations, but especially in operations, initiative equates to mobility. The side whose leaders seize the initiative, the side which is more flexible and mobile, is the side which most often wins.

Flexibility and mobility of units in training and operations comes from the mental flexibility of leaders. It is the ability to create, to be innovative. It is the willingness to act rather than react. It is the ability to comprehend—to understand meaning and intent rather than seeking after and clinging to rote formulas.

Doctrine for Armor in its early years was never dogma. There were few books on armor operations before World War II. That didn't prevent operations from going forward. Leaders understood the concept and the meaning of flexible, mobile operations. They fought with new weapons and new means, but they understood the meaning of the task before them. Understanding does not come easily, and for leaders, it requires several things:

- There must be a sure knowledge that soldiers can perform their individual jobs to a high level of proficiency.
- There must be an equally sure knowledge that crews, teams, and small groups can perform their collective jobs to a high level of excellence.
- Units must be trained in their operational lessons to a high level of proficiency.
- Leaders themselves must hold a sure confidence that they know how to put their units into motion in battle to seize the initiative.
- Leaders must develop and share a common set of battlefield values with their soldiers.

"Flexibility and mobility of units in training and operations comes from the mental flexibility of leaders."

No one can count on personal charisma to provide these requisites. The supply system doesn't issue them, the personnel system can't find them. They must be developed in the essential system—the *human* system. They must be sought through hard work and concentration—by training—just the way they have always been found.

"Professional military competence includes a willing acceptance of disciplined professional responsibility."

Most important to all these notions are four elemental qualities—the qualities which are part of that last notion—a shared set of common values. These are, in soldiers terms: competence, commitment, candor, and courage.

First, professional competence. Professional military competence includes a willing acceptance of disciplined professional responsibility; it acknowledges willingness to sacrifice. In the micro sense, professional competence involves, among all the other details of a leader's job,

developing the ability to train the requisite values into our young soldiers of today. For without them, you can't have an effective military organization—large or small.

Commitment is a sense of obligation to something larger than yourself—profession of arms is a commitment—an obligation. As rank increases, so grows the commitment to larger issues and purposes. But, closer to the bottom, the obligation is to the unit of which we are a part and to the men and women we lead. In either case, the commitment is to something larger than ourselves—there is no room for careerism, "what's in it for me," "look out for old number one."

Characteristic of today's changing society is the way in which the language is used to diffuse the truth. It may be we don't tell the truth very much any more because it's most often unpleasant. It may be that it's just harder to discern truth because today's issues are too complex. In any case, the military profession must hold in high merit the virtue of candor—the willingness and ability to discern and tell the objective truth. In political-military deliberations, candor, with regard to the capabilities and limitations of military force in pursuit of political objectives, is essential. Had we had more of it perhaps the legacies of Korea, the Bay of Pigs, and Vietnam would not today be so burdensome. A willingness to tell the unvarnished truth is similarly an essential ingredient of leadership in units of a military force. In battle, it is always necessary to tell the truth—someone's life usually depends on it.

Finally, there is courage—the courage necessary to tell the unpleasant truth; the courage to make a commitment to something larger than yourself; the courage to insist on that higher order of values essential to a successful military profession; the courage to understand and articulate convincingly the extent to which military force has utility in the pursuit of national objectives; the courage to insist that those objectives be defined and made clear so that some decent assessment might be made of the best way in which they might be sought, attained, and secured.

None of these values is more important than any other. More importantly, none can exist for very long without the others. They are truly interdependent. If you ask how do these fit together, I would have to answer that I'm not sure yet after over 30 years in military service. But I can give you an example from which you may draw your own conclusions.

When I commanded the 11th Cavalry in Vietnam, it was routine for me to interview each new officer reporting for duty with the Regiment. Normally, this was done at night, long after the day's fighting had died down, and after my battle with the paperwork was done. Among other things, I asked each of them if he was afraid; for I believe that all of us are afraid in that world of battle, but only those who are willing to admit it are capable of coping with it. I had a lot of strange answers to that question—most people simply hadn't faced up to it—for it is one of those very, very complex questions of life. Faced with the question some backed off and refused to take command of their units; others passed it off with a shrug of bravado; most concluded with a "Well, now that you ask, I guess so."

One young lieutenant I remember especially. His response was, "Yes sir, I am afraid; but I've thought a lot about it. I've even asked God's help in finding an answer. God's answer wasn't too clear to me, but I believe this is what I have to do, and that I'm about as well prepared to take command of my platoon as the Army can make me, and I've decided that there are worse things than dying for your country."

He was a good platoon leader—one of the very best. A few months after our talk he was killed as he led his platoon on reconnaissance down a dry creek bed near Loc Ninh. But I found as I looked into the battle that he had been at the head of his platoon—leading. He had seen the ambush, alerted his men, and that his platoon had survived because of his quickness. Not only did they survive, but so angered were they over the death of their lieutenant that, without outside help, they proceeded to destroy the entire North Vietnamese ambushing unit. Then they marched out of the jungle bearing on their shoulders the body of their fallen leader—a man who had the candor to admit fear, the courage to control it, the commitment to succeed, and the competence to do so, values he shared with his soldiers.

"Then they marched out of the jungle, bearing on their shoulders the body of their fallen leader—a man who had the candor to admit fear, the courage to control it, the commitment to succeed, and the competence to do so, values he shared with his soldiers."

In my mind, Armor once epitomized all that in our Army. But as a group—a group of soldiers with the same basic notions—it seems to me we've lost that perspective. No longer are we sought out as the leading purveyor of new ideas. We've become bureaucratic, soft; we lack innovation; we don't suffer well those who do take the initiative. We have a "Ho Hum" attitude.

So, I leave you with a challenge. For you older officers—who remember from whence Armor sprang—it's up to you to think back and see where it went off track. Only you can create the climate that fosters the battlefield values that win and the leaders who will do so. Armor needs a shot in the arm in spirit, and if that doesn't work, maybe we need a *good solid kick in the grill doors*.

"Armor needs a shot in the arm in spirit, and if that doesn't work, maybe we need a good solid kick in the grill doors."

To you younger soldiers, learn your history well—for we must recapture our spirit—only you can do that. Once we were very cocky because we had some good ideas. The ideas are still good; what we need is some renewed dedication to our fundamental values and renewed determination to be willing to act, to seize the initiative—in training—in operations—in battle—in victory.

A Users Guide to Close Air Support

by Captain Charles E. Wright

Most Army commanders realize the importance of close air support (CAS) to the overall battle plan, but some confusion prevails over the method of application and the means by which air support gets to the Army. The classic definition of CAS is, "Air action requested by the ground commander against hostile targets in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of the supported force."[1] The words "close proximity" imply the area of the battle zone from the forward line of troops (FLOT) to the fire support coordination line (FSCL).

The best application of CAS is to targets that cannot be destroyed or neutralized with organic fire support. Considering the amounts and types of weapons available to the contemporary ground commander, the only time he would *require* CAS is when his hostile targets are either out of range or have so overcome him with numbers that his organic weapons cannot engage them all. In either case, the commander must rely on timely intelligence in order to engage the hostiles in the area of his choosing.

In order to engage the hostile targets while they are still out of range of organic weapons, you must acquire them (and initiate a CAS request) at a range of 20 kilometers from your engagement location. This range is based on an average closing speed of 8-10 kilometers per hour and considers an average response time to an immediate request made at battalion level. Based on the same closing speed and response time, you should initiate your request for CAS when the hostiles are *no closer* than 10 kilometers. If the request is not made at the 10-km point, you run the risk of not only being *overwhelmed* but being *overrun*.

Some feel that our intelligence will be so good (in the next war) that the Army can handle the Warsaw Pact forces at the FLOT without the benefit of CAS. However, FM 100-5, *Operations,* makes it very clear that our Army must rely on air power and integrate it with our own fire support. The Air-Land Forces Application Agency (a joint Training and Doctrine Command and Tactical Air Command Agency) has made the assumption that "At main points of attack, the U.S. Army alone cannot successfully defend against a certain level of Pact ground forces"[2] and that the Pact has the capability to reach that "certain level" at will. So ground soldiers, resign yourself to your fate, you need CAS, and considering the battlefield environment, you need to use it properly.

"FM 100-5 makes it clear that the Army must rely on air power and integrate it with its own fire support."

The Environment

The Air Force folks call it "high threat." And if you take a close look at the "unclassified" airspace cross section and table of Soviet air defense weapons, you will see why. Our current generation of CAS aircraft rely on speed, heavy armor, erratic maneuvers, and electronic countermeasures to survive at or near the FLOT. You can help him survive during the time he flies for you.

In close proximity to the FLOT and while delivering CAS, the fighter is most vulnerable to the *SA-7* and the *ZSU-23-4*. These are weapons on which you can have a profound effect with artillery and direct fire weapons. Artillery and small arms are effective in suppressing *SA-7* gunners and antitank weapons are excellent against the *ZSU*. Anything you can do to enhance the fighter's survivability will make his sortie more effective for you. The suppression of Soviet air defenses will not be easy and will require close coordination and exact timing. (See table 1 for Soviet air defense data.)

What can you expect of the fighters once they get to you? In the past, particulary in Vietnam, CAS fighters relied primarily on a marking rocket delivered by the forward air controller (FAC) to locate the target. Once the target was found, the fighters orbited in a "wheel" and alternately struck the target.

Now that the air over the FLOT is a "death zone," the FAC can no longer deliver accurate marking rockets, and in most cases, the FAC orbits at a low altitude almost 20 km behind the FLOT. This changes the method of CAS delivery considerably. Now the fighters orbit at a contact point (CP) well behind the FLOT, at this point the forward attack coordinator airborne (FAC-A) will brief the fighters based on information received from the forward FAC (FFAC).

"Now that the air over the frontlines is a death zone, the FAC can no longer deliver accurate marking rockets, and in most cases will orbit about 20 km to the rear."

The FFAC is the battalion FAC and may be on foot, in a jeep, armored personnel carrier, or helicopter. The fighter briefing includes target type, elevation, distance and direction from an initial point (IP), clearance instructions, frequency and call sign of clearance authority, abort code, Threat information, and egress instructions. When the briefing is concluded, the FAC-A instructs the fighters to depart for the IP and to report passing the IP. When the FAC-A receives the IP call, he advises the FFAC that the fighters are inbound. When the fighters have gone a specified distance from the IP, they initiate a popup or "pop."

During the time the fighters are enroute from the IP to the pop point, they are extremely low and traveling fast. The popup serves to slow them down and get them up so that they can see the target. The fighters call, "In the pop," to the final control authority (usually the FFAC), this alerts him to start looking for the aircraft to insure that they are aligned on the proper target. The abort code is used to "call off" an aircraft that might be engaging an improper target.

In a high threat environment, you can expect all fighters except the *A-10* to make one pass and lay down all of their ordnance. The *A-10* loiters in the target area for an extended time and its attack sequence is basically the same as described except that it remains at a relatively low altitude and works in concert with other *A-10s* and attack helicopters.

In a target-rich environment, you would assume that target identification is not a problem, but that is not the case due to the following factors.

The initial request for CAS has a 6-digit coordinate for the target location, and it would be sufficient if the tank column to be destroyed is stationary for an hour. That is unlikely, however, so the request should include coordinates for the head of the column, direction of movement and speed, and coordinates of the optimum engagement area. Whether the target is stationary or moving, a 6-digit coordinate is used to describe the target location.

"In a target-rich environment, you would assume that target identification is not a problem, but that is not the case . . ."

An immediate request precludes briefing the fighter crew on the target before take-off, and in most cases, the fighter pilot does not have a map of small enough scale to locate your target. The Air Support Operations Center (ASOC) sends the coordinates of the target to the FAC-A. The FAC-A passes the target location to the fighters as a relative distance (to the

nearest tenth of a nautical mile) and direction from a known point on the ground (the IP). So, no matter how precisely the target location is given by coordinates, the FAC-A will *convert it to "IP ALPHA—354-degrees—8.5 miles—tanks—1,550 feet—attack from north—cleared at IP—push Red one—abort XRAY LIMA—SA-8 3 miles south—egress west,"* all of which is transmitted in a communications jamming environment.

Additionally, the manner in which the fighter gets to a point 8.5 miles from point ALPHA on a 354-degree heading is entirely up to the pilot. All of which makes identification of specific vehicles next to impossible. In most cases, the fighter has to close to less than a mile from the target to be able to tell if it is an *M-60A1* or a *T-62*,—and if it turns out to be a *ZSU-23-4*, well. . . . Therefore, concentrations of armored vehicles are much easier to identify and engage, and considering Air Force munitions, a concentration of armor is the best target for CAS.

"The fighter has to close to less than a mile from the target to be able to tell if it is an M-60A1 or a T-62,—and if it is a ZSU-23-4, well. . . ."

Weapons and Sortie Management

Wide-area antiarmor munitions (WAAM) are still in the conceptual stage, and the operational concept for their employment is classified. Generally, WAAM are cluster-type weapons with a variety of seeker heads that assure multiple kills with one cluster bomb. More details are available from division air liaison officers.

The current antiarmor cluster weapon is the *Mk-20 Rockeye*, it consists of 247 *Mk-118* bomblets. The firing mechanism of the *Mk-118s* has a sensing device that causes them to detonate in the antiarmor mode if they impact on a hard target or in the antipersonnel mode if they impact on a soft target. The *GAU-8* cannon on the *A-10* and the *AGM-65 Maverick* (electro-optical antiarmor missile) round out the primary antiarmor air-delivered weapons. Some feel that the *GAU-8* is overrated since its effective slant range is 4,000 feet or less. The *Maverick*, on the other hand, gives the fighters a standoff capability, but it is limited to a single target. Perhaps with the advent of the WAAM a cluster modification of the *Maverick* may be in order.

"Wide-area antiarmor munitions have a variety of seeker heads that assure multiple kills with one cluster bomb."

The current method of command and control and the method by which the Army obtains close air support is explained in detail in FM 100-26, *The Air-Ground Operations System*. The main complaint with the current system is response time to immediate requests even when there is no communications jamming. The Air Force considers airborne alert aircraft a poor use of a resource, and since the ASOC manages the corps air assets, the Air Force usually gets its way. Therefore, aircraft that are required for an immediate request either come from ground alert or are diverted from a lower priority mission (usually a preplanned mission). There are distinct disadvantages with diverting aircraft since the weapons on the aircraft were meant for the preplanned target and may not be compatible with the target on the immediate request. Furthermore, the pilots for preplanned targets are prebriefed and have formulated their tactics, all of which is out the window when they get diverted.

A partial solution to the problem just described is to initiate a "preplanned immediate" request. This places uncommitted aircraft (those not assigned to preplanned missions) on airborne alert for staggered, specific periods of time. If the aircraft is still uncommitted at the end of the specified airborne alert time, the pilot proceeds to a secondary target to expend his ordnance. This provides an airborne asset to respond to immediate requests, to strike secondary targets, and to be returned to base within a forecast period to be "turned" (rearmed and refueled).

This article is presented to give some insight to ground-oriented soldiers on the hows and whys of close air support. Additional information is available through local air liaison officers. Look them up, they will be glad to see you.

Table 1.

weapon	type	units (batteries)	launcher vehicles	Effective slant range	effective altitude
SA-2	SAM	3	18	45 km	25 km
SA-4	SAM	9	27	70 km	24 km
SA-6	SAM	5	15	30 km	90 m-10,000 m
SA-7	SAM		in rifle companies	3.5 km	45 m-3,000 m
SA-8	SAM	5	20	15 km	50 m-10,000 m
SA-9	SAM	64	256	7 km	45 m-6,000 m
S-60	57-mm AAA	23	138	4,000 m	
ZSU-57-2	twin 57-mm AAA	6	36	4,000 m	
ZSU-23-2	twin 23-mm AAA	19	114	2,500 m	
ZSU-23-4	quad 23-mm AAA	32	128	2,600 m	

CAPTAIN CHARLES E. WRIGHT was commissioned in Infantry upon graduation from OCS at Ft. Benning, GA in 1970. A graduate of the Electronic Warfare Operator/Analyst course, Officer Fixed Wing Course, Infantry Officer Advanced Course, and USAF Air Ground Operations School Battle Staff Course, he has served tours as a fixed wing aviator, artillery forward observer, and company commander. He is currently assigned as the Ground Liaison Officer for the 602d Tactical Air Control Wing (TAC), Bergstrom AFB, TX.

The Savior of Shenandoah

by Captain Patrick M. Howes

Washington, DC lay open to attack and capture. The rampaging Confederate Army, under the tough leadership of Lieutenant General Jubal A. Early, drove the last viable union defense force from the battlefield at Lynchburg, VA. The Union commander, General Hunter, withdrew his army westward into the mountains of West Virginia to lick its wounds. This move left the Shenandoah Valley, a historical corridor to the nation's capital, undefended. General Early's orders from General Robert E. Lee were simple. He must attack, raid, and capture Washington. If possible, he was to capture President Lincoln. It was August 1864.

General Early and his men succeeded in harassing the towns of Chambersburg, PA; Hagerstown, MD; and the home of the wealthy Blair family in Silver Spring, MD. Early demanded and received $220,000 in ransom money from the cities of Frederick, MD, and Hagerstown. Panic and fear prevailed in Baltimore, MD and Washington. Early's exploits were reminiscent of Stonewall Jackson's campaigns in the Shenandoah Valley 2 years before. The citizenry feared for their lives. Something must be done to stop this threat.

President Lincoln, inwardly worried but outwardly cool, consulted with his General-in-Chief, Ulysses S. Grant. At the time, Grant was overseeing military operations against General Robert E. Lee's Confederate Army located in the Petersburg-Richmond, VA area. Grant assessed the situation.

Lee's forces were being pressured in Southern Virginia. General Early, by applying pressure on the capital, could cause the redeployment of combat strength from the Army of the Potomac (opposing Lee) to the defense of Washington. This would weaken Lee's opposition. Grant knew also that 1864 was the presidential election year. The defeat of the Lincoln administration could prolong the Civil War. An attack on the nation's capital would be a tremendous blow to national morale. Historically, the Shenandoah Valley proved disastrous to Union generals. Generals Fremont, Sigel, Banks, Shields, and Hunter were all badly embarrassed by the Confederates.

Grant further recognized the disunity of command the Valley presented. It fell under the military responsibility of four separate area commands. He moved to reorganize this area of operations into the Army of the Shenandoah. He would appoint one commander and he knew that he must select a winner. Grant first recommended the position be given to Generals Franklin or Meade. Lincoln said no. As a third choice, Grant turned to a man who never let him down, General Phillip Sheridan. Initially, President Lincoln and Secretary of War Stanton opposed Sheridan on the grounds that he was too young for such a sensitive position. Grant was adamant. Lincoln acquiesced. Sheridan reported to Grant at Monocacy, VA to take command of the Army of the Shenandoah.

Standing 5 feet 5 inches and weighing a mere 115 pounds, General Sheridan's physical appearance bordered on the unusual. President Lincoln remarked on Sheridan's appearance, saying: "He is one of those long-armed fellows with short legs that can scratch his shins without having to stoop over." "Little Phil" had an exceptionally long torso in relation to his stodgy legs. It is said, that his military uniforms fitted him so poorly that a tailor in the service of General Hooker volunteered to help him free of charge. One elegant Washington staff officer described him saying: "General Sheridan is a soldier's general, a red-faced man with coarse features, who belongs in the field; whatever dash he possesses as a conversationalist is best suited to a campfire."

What Sheridan lacked in physical appearance he more than compensated for with his personality. Sheridan was a fighter, with fierce terrier-like tenacity. As a subordinate commander

at the Union defeat at Chicamauga, Sheridan's bull-like determination to stand and fight saved many soldiers from capture. He was the last to withdraw under extreme fire. Sheridan was a winner who led his men by virture of his personality. This personality owed much to his Irish-American upbringing.

Born the third of six children to Irish immigrant parents, Phil spent his growing years in Somerset, OH. His father contracted and worked for meager wages building the railroads and canals in Southeastern Ohio. Phil cared little for school. He preferred the excitement of mischief and adventure. The Mexican War blossomed and Sheridan followed it religously. He dreamed of the day he too could be a soldier. His ambition was to graduate from the United States Military Academy.

As a teenager, Phil clerked and kept the books for Funk and Ditoes Dry Goods Store in Somerset. There he met and badgered the Honorable Thomas Ritchey for an appointment to West Point. He eventually received an invitation to take the entrance tests. Not well educated, Sheridan employed three tutors for assistance and finally succeeded in passing the examination. Official word came. Phillip Sheridan, Somerset, OH, would enter the U.S. Military Academy, August 1848, as a member of the Class of 1852.

As a cadet, Sheridan's will to fight almost cost America one of its greatest warriors. A cadet sergeant, William Terrill, ordered Sheridan to "dress" (lineup) during a parade in front of his company. In Sheridan's words, "Cadet Terrill and I had a disagreement, I lunged at him with a bayonet." Fortunately, Sheridan's Irish temper calmed before making contact. Terrill put him on report. This so infuriated Sheridan that the next time he laid eyes on Terrill he attacked him again. This time fists flailed. The pugilists were caught in the act. Explanations were rendered and Sheridan was found guilty of throwing the first punch. He was suspended for 1 year. Dejectedly Sheridan, returned to Somerset to wait for reinstatement. He reentered the following year and graduated in the Class of 1853.

Sheridan's military career was rocky at best, until he received command of the 2d Michigan Cavalry. As a Quartermaster for General Curtis' Army of the Missouri, Sheridan was relieved of duty and placed on court martial charges over a horse buying scandal. The charges were later dropped. As a field commander of combat troops, Sheridan's fighting spirit found an outlet. The Battles of Booneville, Stone River, Perryville, Chicamauga, and Yellow Tavern won him the respect and adulation of his soldiers, peers, and superiors.

At 34, General Sheridan was a seasoned veteran of war. He

"Everything, including the November Elections, Union morale, a sucessful end to the war itself depends of victory in the Shenandoah Valley."

organized his new Army of the Shenandoah at Harper's Ferry, and immediately set out to deploy his army to the south of Early's and, in President Lincoln's words, "follow him to the death."

Sheridan's intelligence pegged the Confederate Army at Martinsburg, WV with a strength of 20,000 troops. General Grant implored Sheridan to wait for Early to dispatch combat troops to Lee at Peterburg before mounting an all-out attack. Sheridan waited. This waiting led Early to believe that this union commander was a procrastinator much like his predecessor Fremont, and when pressured, would turn tail and run. Early committed a cardinal military sin. He underestimated his opponent. This assessment of Sheridan could not have been further from the truth.

Sheridan's forces slowly pushed up the valley and located the Confederates at a place called Cedar Creek. By the middle of September 1864, Sheridan's ordered inactivity brought much criticism. Secretary of War Stanton dashed off a warning to General Sheridan. It read: "Everything, including the November elections, Union morale, a successful end to the war itself depends on victory in the Shenandoah Valley." Until Grant gave the word to attack, Sheridan put up with the waiting and the criticism he loathed. Sheridan's effective use of intelligence sprung open the door.

A Quaker school teacher loyal to the Union cause, Miss Rebecca Wright, sent messages directly to General Sheridan via toilet tissue hidden in the mouth of a servant. On the 16th of September, she sent the message that marked the end of Sheridan's inactivity. Miss Wright reported that the Con-

"I had drawn up a campaign plan for Sheridan which I brought with me; but seeing that he was so clear and so positive in his views, and so confident of success, I said nothing about this. . . ."

federates dispatched two divisions of troops to join Lee in the south. Sheridan, overjoyed with the news, mapped out his plan of attack and hastened to meet General Grant in Charlestown, WV with the news.

In Charlestown, General Sheridan did all the talking. General Grant remarked later about the meeting, "I had drawn up a campaign plan for Sheridan which I brought with me; but seeing that he was so clear and so positive in his views, and so confident of success, I said nothing about this, and did not take it out of my pocket." After listening to Sheridan's plans, Grant issued a brief two word order, "Go in."

The 19th of September marked the beginning of three battles that would spell the defeat of General Early's heretofore invincible army.

The Confederate forces were stretched out along a line 3 miles east of the town of Winchester on high ground paralleling the Opequon Creek. Sheridan saw the middle defenses of Early to be weak and spread too thin. He would amass his forces on line, pound the center of Early's defenses, turn the flank on his left with the cavalry, and position his reserve to cut off the retreating Confederates along the road to Winchester.

The plan called for timeliness to catch the thinned defenses before they had a chance to be beefed up. A traffic jam on the road, caused by one of Sheridan's subordinate commanders, caused a 4-hour delay and a furious Sheridan changed his plans. The delay enabled Early to reposition and shore up his middle. When finally in position to attack, Sheridan met an extremely vicious head-on counterattack. Repositioning his reserves on the right flank, Sheridan commited them to battle in a turning movement. General Early's forces proved ready for the task but Sheridan's tenacity and fighting spirit won out. Early pulled back toward Winchester as Sheridan figured. Due to the traffic jam, there were no cutoff forces in position.

As a result, Early survived to fight another day.

The victory over Early met with praise. Lincoln wrote, "Have just heard of your great victory, God Gless you all, officers and men." The citizenry of Baltimore and Washington relaxed for the first time in 2 months. Sheridan was not satisfied. He knew his job was incomplete. He ordered his men to pursue the Confederates the next morning.

The Army of the Shenandoah fixed General Early's position at the crest of Fisher's Hill the morning of September 20. Early had used the hill before as a fortified defensive position. He had great faith in its ability to protect. Sheridan, unhappy about Early's previous escape at Winchester, was determined to finish him at Fisher's Hill. The high ground occupied by the Confederate soldiers was bounded on the left by Little North Mountain and on the right by the north fork of the Shenandoah River. The narrow front between these natural boundaries was 2 miles wide.

General Early had not bargained for a flank and rear attack down the Little North Mountain, but Sheridan did. Union soldiers positioned themselves quietly and undetected in the mountains wooded area. At the base of the mountain, the main body of Sheridan's Army lay in wait. The cavalry was to take up blocking positions to the rear of Fisher's Hill. At sunset, the attack began. The Union soldiers, with Sheridan in the lead waving his rumpled hat, attacked the flank of the unexpecting Confederates. The Confederates broke and ran almost immediately in what Sheridan in his own words refered to as "indescribable panic."

General Sheridan's cavalry let him down again. They did not pursue as instructed. Early escaped. Sheridan was furious about the inaction of his cavalry generals. There would be no

"The cavalry would march for the enemy, and in Sheridan's words, 'either whip him or be whipped yourself.'"

rest. The cavalry would march for the enemy and in Sheridan's words "either whip him or be whipped yourself." One commander of cavalry did not heed Sheridan's wishes. He was immediately relieved.

The next morning Sheridan's cavalry ran into an elite unit of Confederate cavalry known as the Laural Brigade. Perched atop Round Top Mountain, Sheridan watched with satisfaction as his cavalry charged this highly touted unit. A classic cavalry battle ensued with saber thrusts and the maneuver of horseflesh. The Confederate elite were routed. The "Woodstock Races," as the cavalry battle became known, restored Sheridan's pride in his mounted soldiers.

General Early needed reinforcements. General Sheridan

turned his attention to the destruction of the Shenandoah Valley. Crops, railroads, and industry fell under the ordered wrath of the Army of the Shenandoah.

On October 10, 1864, Sheridan was summoned to meet the Secretary of War. By this time Early's army had received considerable reinforcements and he was contemplating an offensive. Sheridan left his army in the command of General Wright. They were encamped at Cedar Creek in a relatively open area. The security of Sheridan's army grew lax in his absence. An unsuspected attack came in the dawn light of October 19th.

Early met with quick success. His forces routed the left flank of Sheridan's army. Sure disaster seemed inevitable for the Army of the Shenandoah. With some premonition of a Confederate attack, Sheridan sent a runner for news of his forces. The news was bleak. General Sheridan leaped into the saddle, charging hard along the 18 miles to the battlefield.

Along the route to Cedar Creek, Sheridan encountered many of his men in retreat. Magically, he transformed these retreating forces by appearing when he did by coaxing them to shoulder their muskets and turn in the direction of the enemy. One private related the phenomena in a letter home. "The first

"I saw General Sheridan coming, . . . saying 'Come on boys, to the front with me, and we will make this matter all right.' "

thing that attracted my attention was the clatter of horses' feet on the pike; and the loudest cheering I ever heard. When I looked up, I saw General Sheridan coming, followed by his bodyguard. Sheridan was about 50 yards in advance with his hat in his hand saying as near as I could understand, 'Come on boys, to the front with me, and we will make this matter all right.' It was an awful moment but I could not help but think of Jack and the Giant Killer, but everybody and everything followed Sheridan."

Sheridan's piercing black eyes grew sharper in the face of what lay ahead. As he approached the battle line, there was a swelling roar of men returning by the thousands to follow the general that never let them down. "Here's Phil Sheridan—we're going back," men shouted to one another. Sheridan rode up and down the battle imploring his men "About face boys, we're going back to our camps, we are go-

Sheridan ... implored his men, "About face, boys, we're going back to our camps, we are going to lick them out of their boots."

ing to lick them out of their boots." The men responded.

After 6 hours of reorganizing his forces, Sheridan ordered the counterattack. The Confederates were bewildered and disheartened to see the tide of battle flowing in favor of the Union Army. Sheridan was personally in the lead of the counterattack, familiar hat in hand, extolling the troops. General Early's soldiers could not hold and broke in retreat. This time they could not escape the pursuit of Sheridan and his men. The Battle of Cedar Creek ended. General Early had finally been defeated. The nation's capital was safe.

The Shenandoah Valley campaign was finished. To the men it seemed magical the way their general turned certain defeat into victory at Cedar Creek. Much praise and permanent promotion to Major General were heaped on Phillip Sheridan. The Union Army was victorious. This business over, the Army of the Shenandoah prepared their encampment for the winter months.

General Sheridan's actions in the Shenandoah Valley hold some valuable lessons for today's armored and cavalry leaders.

The General personified the principle of "commanders far forward." . . . When time were tough, Sheridan did not panic. He led.

Sheridan knew his mission, his enemy, the terrain, and the men he had available, and he maneuvered accordingly.

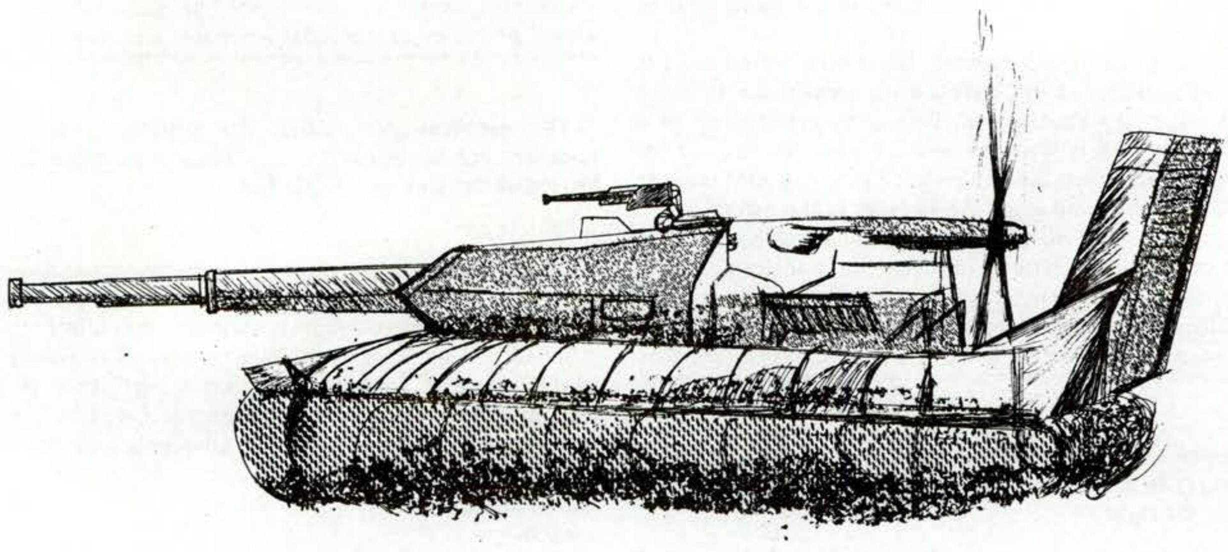
Sheridan demonstrated the effectiveness of recruiting the local populace for timely frontline tactical intelligence. He personified the flexibility crucial to successful mobile warfare. When his well-conceived plan at Winchester bogged down due to an unforeseen traffic jam, Sheridan did not hesitate to change his course of action on the spot, and get on with the mission.

The General personified the principal of "commanders far forward." His tenacity, aggressiveness, and personal presence at the front spelled the difference between victory and defeat on several occasions, particularly at Cedar Creek. When times were tough, Sheridan did not panic. He led.

The Valley Campaigns were costly. Sheridan estimated losses to be 34,000 men killed, wounded, or missing. Whatever the cost in lives, the campaign was won. Sheridan truly lived up to Grant's remark "Sheridan is a winner."

Phillip Sheridan, the Irishman from Somerset, OH, small in stature, large in ability, courage, and personality, lies buried in Virginia's Arlington Cemetery; not far at all from the Shenandoah Valley.

CAPTAIN PATRICK M. HOWES was commissioned in Armor as a Distinguished Military Graduate from Ohio State University in 1971. His assignments include duty as a Tank Platoon Leader and Company Executive Officer, C Company, 1st Bn 37th Armor and Squadron Motor Officer and Troop A Commander, 1st Sqdn, 4th Cavalry. A graduate of the Armor Officer Advanced Course, he recently completed his MA in Communications at Purdue University and is currently assigned to the Office, Chief of Public Affairs, Department of the Army.



Future Armored Vehicles

Flying Tanks

by Colonel R. R. Battreall (Retired) and Major Joe L. Riggins

Most current efforts to develop operational concepts and the related equipment requirements and force structures have focused on the 1986-95 time frame. But, the rapidity of evolutionary trends in both ground and aerial mobility and firepower creates a need to conceptualize future armor operations beyond the turn of the century.

This article presents such a future armor concept in general terms, based on an assessment of past and present evolutionary developments in the use of armored fighting vehicles and of armed and scout helicopters. Our hope is to stimulate though and discussion.

Threat Trends. In the past, Threat planners and tacticians felt that the helicopter was too expensive to be used for assault missions. They have now reversed their thinking and, in addition to their extensive tank fleet, produce several variants of the *Hind,* one of the most heavily-armed attack helicopters in the world. It is utilized as an aerial platform for bombs, rockets, misiles, and machineguns andd can be used in antipersonnel, antiarmor, and antihelicopter roles. The *Hind* is currently fielded in large numbers in keeping with Threat doctrine of massed firepower and mobility.

We expect the enemy's future doctrine and tactics to continue to emphasize massed firepower and mobility. There will be evolutionary improvements in reliability, fire control, avioncis, and visionics. The night and all-weather weapons capability of Threat helicopters will improve, and their vulnerability to air defenses will be reduced. Attack helicopters will compete with the tank in mobility, firepower, and shock

action; assuming an ever-increasing role in future Threat armor operations.

Environmental Factors. Trends in land usage are important considerations for future armor operations. Former centers of urban concentration are developing into urbanized corridors. Communication networks are expanding. Increased areas of agricultural land are being converted to urban and forestry use with a consequent reduction in terrain suitable for ground-restricted armored operations. Waterways necessitating engineer crossing assistance also present difficult obstacles adversely affecting ground mobility.

In reviewing environmental factors, emphasis has been placed on the NATO Central Region as a primary area. Past terrain studies of this area indicate the following average possibilities for detecting armored vehicles form ground positions:

Up to 2,000 m	**70-80%**
2,000 m - 3,000 m	**10-20%**
3,000 m - 4,000 m	**5-15%**
Over 4,000 m	**A very small percentage**

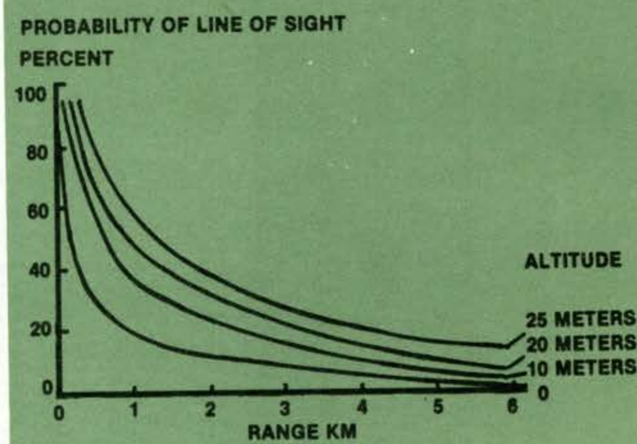


Chart 1

In contrast, the following terrain study (chart 1) of the same area indicates the probability of line-of-sight at varying ranges up to 6,000 m to be significantly greater for each meter of altitude we can give the observer above the ground.

Visibility is limited in the NATO Central Region by darkness, rainfall, and ground fog or mist. Target acquisition ranges and all-weather operations, however, will continue to be enhanced by further improved night vision and sighting devices.

Trends in Technology

Ground fighting vehicle technology will continue to make evolutionary improvements in firepower and armor protection, but we appear to be approaching the upper limits of opertationally useful ground-vehicle mobility.

Presently, technological progress is being made to provide helicopters with all-weather and night operations capabilities, improved target acquisition, hardened materials for airframes and rotors, and greater mobility utilizing the advancing blade concept. Continued research may eventually lead to the replacement of rotor blades by a more efficient and reliable system, thereby decreasing vulnerability and costs.

Aerial firepower improvements are being made in the areas of acquisition devices such as the Target Acquisition and Designation Subsystem (TADS) and Stand-Off Target Acquisition System (SOTAS). Range and accuracy are being improved not only through laser rangefinders and designators but also through integral terminal homing to provide a true "fire and forget" capability, thus permitting simultaneous engagement of multiple targets and enhanced aircraft survivability.

Evolutionary Potential of the Helicopter

To visualize potential armor concepts, a brief historical analysis of the modern military helicopter and its present concept of employment may serve to illustrate its evolutionary potential.

The Korean War proved that the helicopter could be of considerable value in evacuating wounded and transporting personnel. Helicopters were generally used, however, for artillery spotting, reconnaissance, and command transportation similar to the role of the light fixed-wing aircraft of World War II. Not until shortly before the armistice did testing prove conclusively that helicopters could be invaluable in moving combat troops above the battlefield, thereby adding a new dimension to Army operations.

After the Korean War, several test projects were established to determine the feasibility of using the helicopter for cavalry missions. The *Sky Cavalry Concept, Armed Helicopter Mobile Task Force* and *Army Aircraft and Ground Forces Mobility Study 1948-1970* demonstrated that Army units could perform reconnaissance and security missions from the air and that they possessed great combat potential.

In 1962, the Secretary of Defense formed a board headed by LTG Hamilton H. Howze to study the Army's tactical mobility requirements for the future. The *Howze Board* conducted numerous tests and developed many original ideas in the field of tactical mobility. The air assault division and air cavalry squadron are both results of the work of this board.

Airmobile operations in Vietnam vastly increased the availability and flexibility of combat forces, thereby contributing significantly to tactical success. During this era, the armed helicopter was first utilized as a means of providing both aerial escort for troop-carrying helicopters and organic close air support for ground troops. Proving its effectiveness in this role, the armed helicopter began to evolve into a combat vehicle. Weapon system advancement permitted the helicopter to expand its combat role, and during the Easter Offensive of 1972 it proved successful as an antiarmor weapon.

The Helicopter Today

The evolution of armed helicopters continues today. The attack helicopter is now an accepted and respected member of the combined-arms team, adding new meaning to mobility and firepower in two distinct roles; the first being as air cavlary.

Air cavalry organization is based on scout helicopters supported by attack and utility helicopters, the latter carrying ground scouts called aeroreconnaissance squads. Air cavalry units conduct essentially the same missions as their ground cavalry counterparts. Air cavalry can greatly expand and ac-

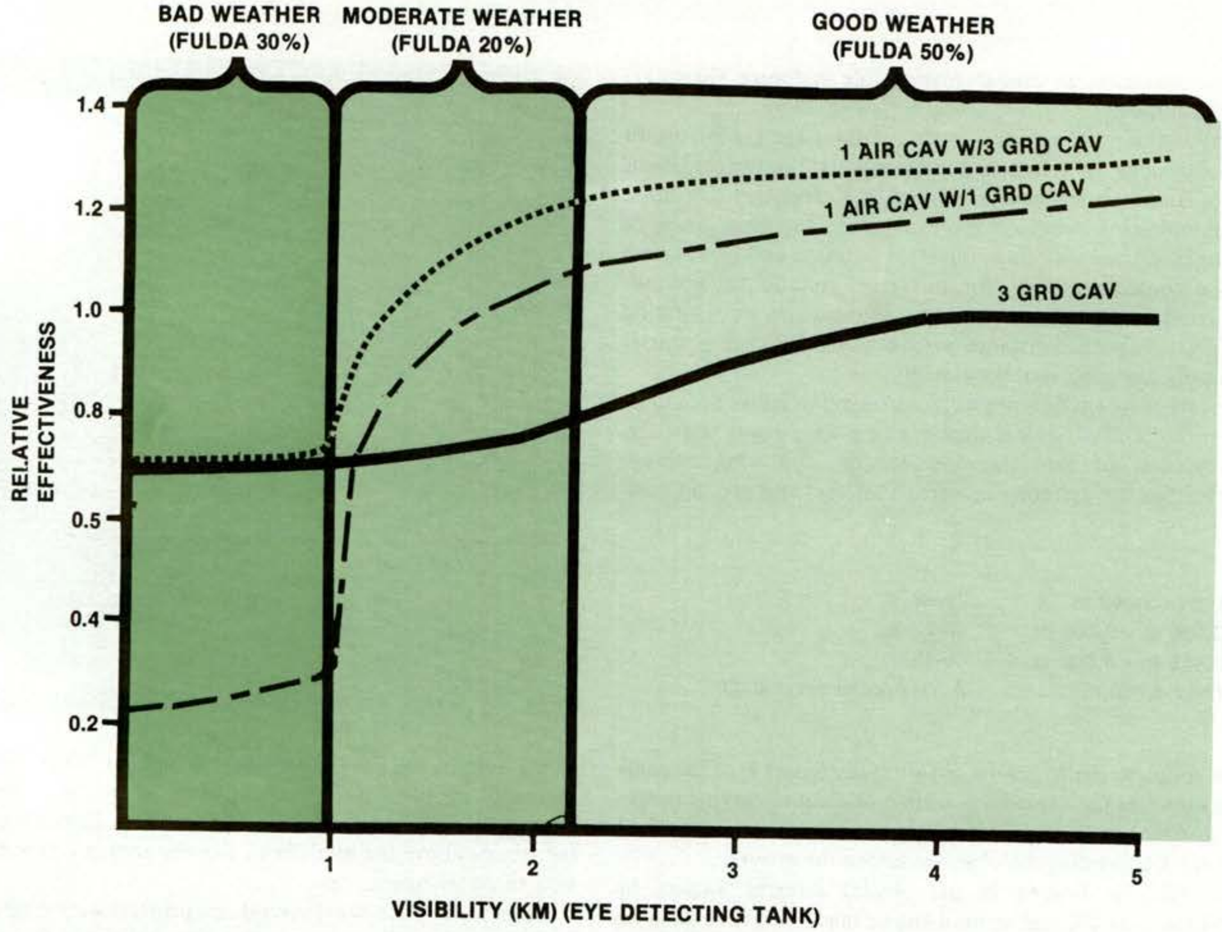


Chart 2

celerate conventional cavalry functions by using the flexibility, mobility, and firepower of their unique mix of helicopters. Air cavalry may operate independently, but it is most effective when employed in conjunction with ground forces, particularly with a cavalry ground force whose organization, primary mission requirements, and training are consistent with air cavalry concepts.

Chart 2, from the *Air/Ground Cavalry Study* conducted at the U.S. Army Combined Arms Center throughout 1978, illustrates the degree of relative effectiveness of air cavalry when employed in various mixes with ground cavalry under different visibility conditions. Currently air cavalry pays the highest dividends in good visibility when tactical operations are fast moving or changing and the terrain is difficult for the movement of ground forces. Air cavalry can move at speeds greater than ground force main bodies on high-speed approaches and provides early warning and limited protection through delaying tactics. The study concluded that the optimum mix with current technology is one air to three ground cavalry troops.

Reconnaissance, the primary function of air cavalry, is performed primarily by scout helicopters. An organic ground element, the aero reconnaissance platoon, augments their capability when detailed reconnaissance is necessary on the ground, such as providing bridge classifications, checking fording sites, and investigating vegetated or built-up areas.

The attack helicopters of the cavalry units overwatch the air and ground reconnaissance elements, engaging not only targets which may threaten the scouts but also targets of opportunity consistent with the overall mission.

Effective reconnaissance automatically provides a significant degree of security. Security as an assigned mission, on the other hand, implies use of air cavalry to screen the front, flanks, or rear of a protected force, possibly in conjunction with armored cavalry executing a guard mission. This is accomplished by reconnoitering the assigned zone to find the enemy and then engaging to delay him and develop the situation, thereby providing the overall commander both additional time and information for preparation. The protected friendly force may be ground, airmobile, or attack helicopter units or any combination thereof.

Air cavalry is also well suited to the economy-of-force role; freeing larger units for employment elsewhere. Examples of economy-of-force missions include raids to disrupt or deceive the enemy; limited-objective attacks to seize key terrain (such as a bridge, road junction, or vantage point) and hold it temporarily; and relieving friendly units in less-threatened defensive sectors so that they may concentrate at the critical point.

The second role of the armed helicopter is in the attack unit configuration. The capability to fire antitank muntions from helicopters led to the development of organizations designed to destroy or disrupt massed armor formations by using aerial firepower, maneuver, and shock effect as a new combat maneuver element of the combined arms team. These units are organized around the attack helicopter supported by the scout helicopter, a reversal of the emphasis in air cavalry. They are ideally suited for situations in which rapid response is important, when there are inadequate friendly ground forces in the area of contact, or when friendly ground forces are restricted by terrain.

Using their flexibility and considerable mobility advantage over ground combat units, attack helicopter units can rapidly concentrate heavy, long-range firepower to meet a threat or to

exploit enemy weakness in one location and shift as quickly to another threat or target of opportunity elsewhere. They are, therefore, integrated into the tactical plan of the ground force commander, complementing his plan of operation and synergistically enhancing the capabilities of both attack helicopters and ground combat forces.

Further organizational modifications are envisioned to maximize the capabilities of current helicopter organizations. A new air cavalry attack organization has been proposed to embrace the *find and fix* function of air cavalry and the *destroy* function of attack helicopters in a single unit.

Although this new organization is only in the planning stages, it is envisioned that it will function as either an air cavalry or an attack helicopter unit in any part of the battlefield. It will consist of scout, attack, and utility helicopters organized into combined arms troops, each capable of either reconnaissance and security or intense combat.

Future Armor Force Mounts

These past trends in helicopter capabilities and employment concepts, coupled with technological advances reasonably to be expected in the future, offer interesting possibilities for armor forces utilizing a zero-ground-pressure vehicle (ZGPV). The fundamental role of mobile combat will remain, but the advantages of such a vehicle to a future armor force will dramatically alter current employment concepts. Terrain obstacles would have little impact on the movement of ZGPV-equipped tactical units. Breaching and clearing tasks would no longer be critical to speed of execution. Commanders would have unlimited choices of location and direction in making contact with the enemy. ZGPVs would follow for simultaneous exploitation and pursuit operations. Hasty attacks to take advantage of enemy defensive weaknesses could and would occur with increased frequency as ZGPVs cause future battlefields to become more fluid. Deep penetrations striking at enemy command and logistical centers would be commonplace.

The ZGPV's enhanced mobility, of course, presents defensive problems if Threat forces possess an equivalent capability. Although strategically important terrain could be occupied by ZGPVs if necessary, the battlefield itself would become too vast to be continuously controlled by any one force. Threat ZGPVs could avoid detection by flying nap of the earth and strike with unprecedented surprise against either logistical or combat elements. Defense would rely heavily on early detection of the enemy by the use of scanning devices or ZGPV security elements patrolling large areas in order to detect and intercept enemy attacks.

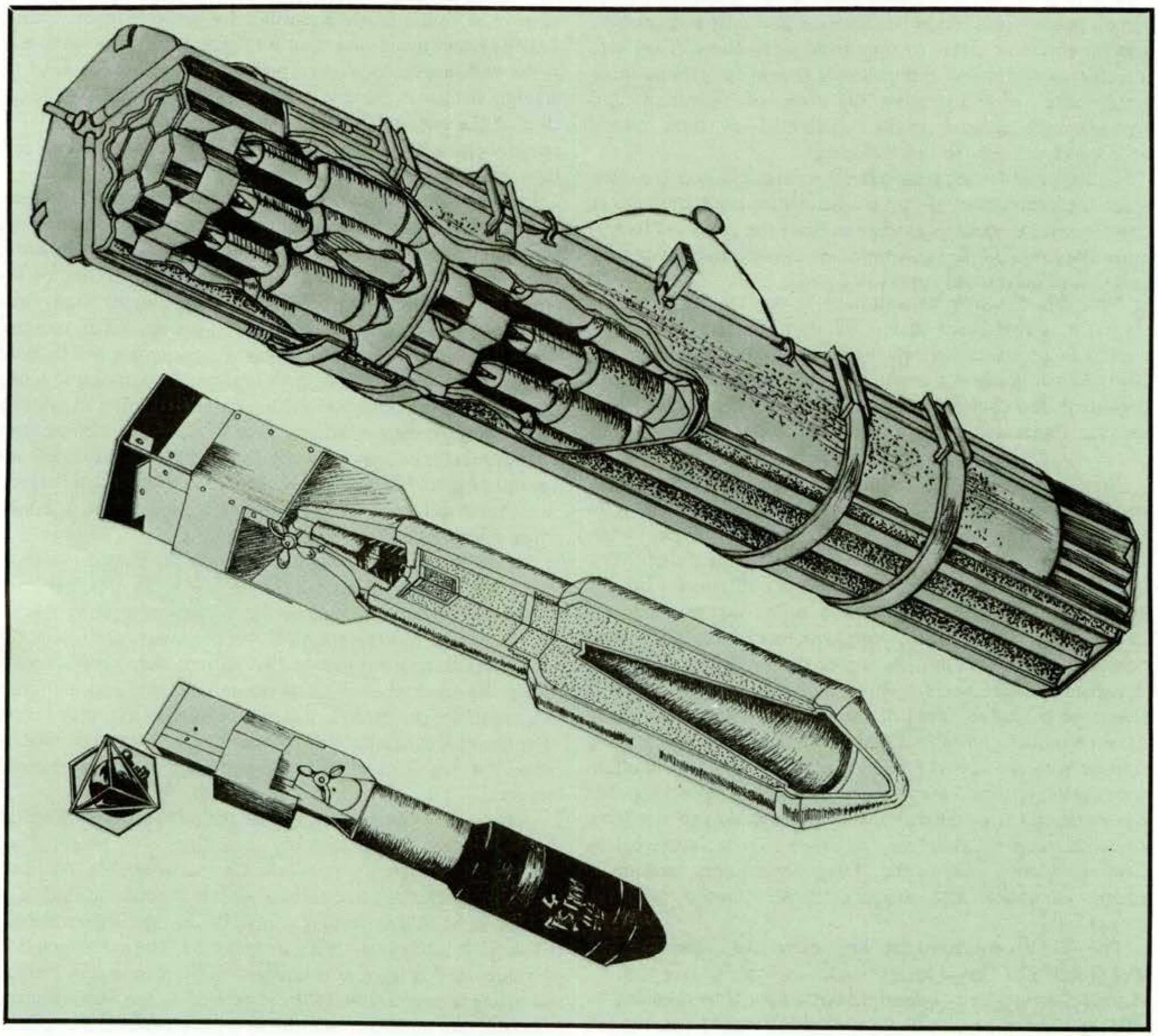
Future technology can be expected to improve the simplicity, reliability, and maintainability of ZGPVs. Improvements in reliability and night/and all-weather capabilities will allow continuous operations, while reductions in rotor size or introduction of different principles (e.g., ducted fans) will enable ZGPVs eventually to operate *in,* as opposed to *over and around,* forests and built-up areas. Engagements will become more frequent, of shorter duration, more intense, and more decisive than previous battles. Improved antiarmor munitions with increased ranges, accuracy, and lethality combined with the advantages of day and night air acquisition capabilities will result in higher kill ratios at longer ranges. "Fire and forget" munitions will enhance both the effectiveness and the survivability of zero-ground-pressure vehicles.

Future armor concepts must recognize the possible replacement of the Main Battle Tank as we know it today, not because of an antitank weapon but because of a superior vehicle better able to generate mobility, firepower, and shock action. Recognizing this eventuality, current armor leaders must avoid the error of their horse-borne forebears and embrace, not resist, the proffered new mount. Only thus can they ensure that the new capability will be used by those who best understand the role of mobility and firepower so critical to tactical success.

Although a long transitional period and technological hurdles remain, the mobility and firepower potential of ZGPVs will eventually revolutionize the battlefield. The tactical potential of a force able to operate around the clock and oblivious to blown bridges, minefields, and other terrain obstacles literally boggles the imagination. The side which first develops and integrates these capabilities can expect tactical advantages comparable to those derived in the past from the phalanx, the longbow, and the internal combustion engine.

MAJOR JOE L. RIGGINS was commissioned in Armor from OCS at Fort Knox, Kentucky, in 1966. His service includes assignments as a AIT and BCT company commander, various positions in air cavalry units in Vietnam, and as an ROTC instructor at the University of Toledo. He holds a BA degree in history from Indiana University and is a graduate of the Armored Officers Advanced Course. Presently, he is assigned as the Air Cavalry and Attack Helicopter Operations Officer, Directorate of Armor Doctrine, U.S. Army Armor Center.

COLONEL R. R. BATTREALL, a frequent contributor to ***ARMOR,*** was commissioned from the U.S. Military Academy (USMA) in 1949. His service includes over 8 years in the 14th, 11th, and 3d ACRs, a year with 1st Cav Div, and 3½ years in Vietnam. Other assignments include USAREUR HQ, two tours at USMA, SJS at USSOUTHCOM, and Deputy Chief of the US Military Mission to Saudi Arabia. A graduate of the Army War College, his last assignment was as Director of Armor Doctrine at the U.S. Army Armor School. He retired on 31 July 1979 after almost 36 years service.



Shaped Charges Versus Armor

by Joseph E. Backofen

This is the third in a series of articles on tanks and the technologies or armor penetration, armor, and survivability.

Much has been said about tanks being "dead." Usually, this has been credited to the capabilities of shaped charges to pierce "all known armor" and of antitank guided missiles (ATGM) to achieve a high probability of target hit at extended ranges.[1-4] Now, in turn, it has been claimed that Chobham armor and special armors make shaped-charge weapons ineffective.[5,6] Thus, it is appropriate to explain and review shaped-charge technology, its effectiveness against tank components, its weaponization, and its battle record. Before doing so, let's note that other nations also refer to shaped charges as hollow charges *(hohlladung)* and cumulative charges.

The shaped charge was originally known by the directional effect that was caused by an explosive charge in which an unlined hollow was built into the end

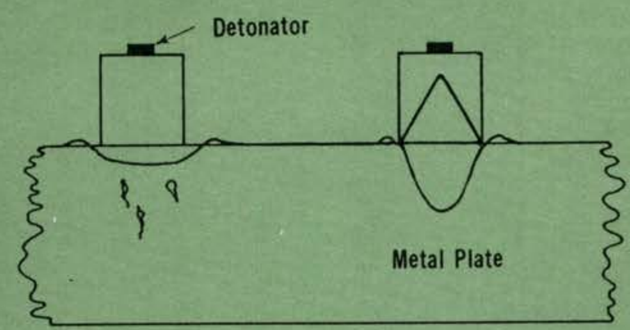


Figure 1. Illustration of the effects on a metal target of a solid charge of explosive and of an unlined shaped charge.

opposite the detonator.[7] This is illustrated in figure 1. Apparently, the directional effect had been known in the mining industry since the late 1700's. However, it was rediscovered by M. V. Foerster in 1883 and by C. E. Munroe in 1888. Munroe published technical papers that showed, among many items of technical interest, the practical effect produced against a safe when a number of dynamite sticks are wrapped around a metal can (the 4.3-kg charge produced a 75-mm diameter hole through the 120-mm laminated steel and iron safe wall).[8]

During the early stages of shaped charge weaponization research, the effect of the liner was not truly appreciated and it was principally used to maintain the shape of the hollow cavity during launch and impact. On February 4, 1938, Professor F. Thomanek discovered the importance of the liner. This breakthrough and later usage of flash radiography (x-ray pictures taken so quickly that a clear image of the explosion, liner collapse, jet formation, and target penetration (figure 2) can be seen on photographic film) led to the technical description of the focus of the liner and formation of the jet.[9,10]

In brief, the detonation of the explosive causes the liner to collapse toward the axis of the charge. Under the very high pressures exerted first by the explosive and second by the impact along the axis of the charge, the metal behaves as if it is a liquid. During the convergence on the axis, a portion of the liner flows into a jet and the remainder flows into a slug. By means of varying the shape of the charge and/or liner, the amount of material going into each portion and the velocities of the jet and slug can be controlled.[7,11,12] In general, this metal in the jet is solid and hot (but not molten). The reason for this is that a hot solid piece of metal can be stretched to great length, whereas a molten jet usually breaks up into droplets.

It is usually rather difficult to visualize how the shaped charge can focus the energy of the explosive charge and produce a jet of high velocity material. However, there are two simple experiments that will illustrate the basic principles. The first can be performed using a tennis ball and a tub full of water. Drop the ball from a height of about one meter into the tub. As the ball pushes through the water, it will form a cavity that will close in on itself and produce a jet that squirts up clear of the tub.

The second experiment is more effective and more typical of a cumulative jet. In this case a partially soggy "Nerf" ball should be dropped from a chest height into a swimming pool. As the rough deformable ball penetrates the water, it will produce a hollow cavity that will collapse and squirt a jet. It is sometimes possible to produce a jet of droplets that will be more than head high. This latter experiment usually shows the problem with liquid (molten metal) jets; namely, the droplets have a tendency to defocus and travel separately in defferent directions.

A solid metal jet can be stretched until it breaks, and some ductile metals such as gold, copper, and aluminum can be stretched to great lengths when they are hot. This stretching helps jets made from these materials achieve greater penetration than jets that particulate easily because they were made from a material that either melted or was brittle.

The following formula based upon a fluid dynamic analysis (Bernoulli's equation) can usually be used to approximate the depth of jet penetration:

$$\mathbf{P} = \mathbf{L}\sqrt{\mathbf{pj}/\mathbf{pt}}$$

where **P** and **L** are the depth of penetration and jet length, respectively, expressed in the same units of measure (mm), and **pj** and **pt** are the density of the jet and target, respectively, expressed in the same units (grams/cc).[3]

The theoretical basis upon which this formula is based assumes a number of things such as that the pressure exerted by the jet remains high enough for the target to behave as a fluid, and that target material pushed to the sides of the crater remains there so that it doesn't have to be rehit (fluid streamline geometry).[3] In light of this formula a jet of higher density, such as gold, will penetrate deeper than that of lower density, such as copper, if the jets have the same length. Since the ductile, high-density materials such as gold, platinum, and the like are rather expensive, the usual material used for shaped charge liners is a soft ductile pure copper.

Armor penetration by a modern copper-lined shaped charge can range from 4 to 7 times the diameter of the liner depending upon the charge design, armor hardness, and the distance between the base of the charge and the target (standoff). This is illustrated in figure 3. The penetration into a target is independent of the angle between the axis of the charge and the surface of the target so long as the surface is not too close to the explosive charge. Expressed in other words, the proximity of some

material to the side of a shaped charge (such as can happen when a warhead strikes alongside a tool box) can affect the pressure exerted on the liner such that it does not collapse symmetrically. When this happens, a bowed jet will be formed that has poor penetration capabilities.[13]

When a jet pierces a target plate, (figure 2) it produces a small cloud of spall particles from the rear surface of the plate. These particles travel off the back of the plate in an expanding cloud that looks just like the cloud of earth and rock that one makes when exploding a shallowly buried charge in an open field. The spall debris travels about the interior of the tank along with the particles formed from the remainder of the jet and causes behind-the-armor damage. In general, the spall particles have a lower velocity than the jet particles and cause less damage; but they can still be deadly to crew members and some equipment. In the particular case of aluminum armor, however, the spall particles can sometimes cause a devastating effect.

When a shaped-charge jet is pushing on a target plate, the high pressure deforms the target material and raises its temperature.[14] If the target material has a low melting temperature, such as found with lead, then the target can melt. For normal armor materials such as steel and aluminum alloy, the target material only undergoes plastic deformation and gets hot. This heating can be experienced in a small way by feeling how warm a paper clip gets as you bend it back and forth.

When hot spall particles are propelled off the rear of the target plate, across the compartment, and impact against a hard surface, they get hotter through impact shock heating.[14] If at this time they are broken into fine molten particles clean of an oxide coating, then they can burn so rapidly in air that an explosion (similar to those that occur in grain storage elevators) will occur.[15-17] This can have a lethal effect on the crew or passengers of an armored vehicle such as an *M-113* armored personnel carrier.

Fortunately, there are rather specific requirements needed for this behind-armor effect that are not always satisfied. First, a large number of high velocity hot particles have to be generated during target perforation by the jet. This is assisted by high-hardness aluminum alloys and large diameter/high velocity jets. It is hindered by the use of plastic interior liners used to catch and/or suppress spall generation. Second, the particles must be raised above melting temperature and pulverized by impact against a hard surface. They then must be mixed with air, carbon monoxide, or carbon dioxide to promote rapid burning. These latter conditions are also suppressed by the use of a spall liner since the particles usually would be absorbed by the liner upon impact on the other side of the vehicle.

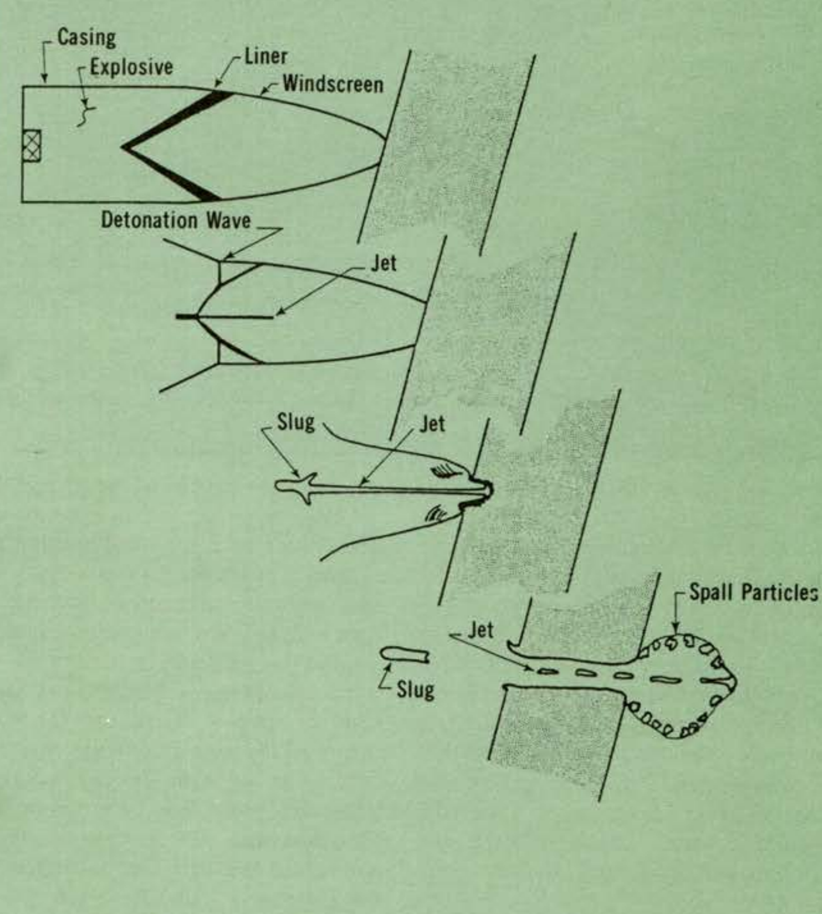
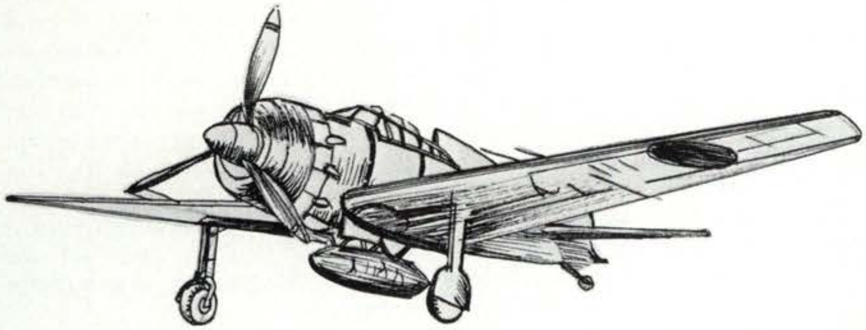


Figure 2. Illustration of shaped charge functioning and target defeat.

A shaped-charge jet can cause explosions similar to that described for the aluminum particles if it is passed through a partially filled container of gasoline, volatile hydraulic fluid, or other fluids susceptible to rapid combustion when atomized and heated.[17] Knowledge of this has generally been responsible for the usage of diesel fuel for armored vehicles, as well as for fuel tank compartmentalization or location outside the principal crew compartment armor.

The most spectacular behind-the-armor effect caused by a shaped charge is the initiation of an armored vehicle's ammunition. This is achieved when a jet or some particles from a jet penetrate into either a high explosive warhead or a propellant charge. With respect to the former, it should just be sufficient to remember that blasting caps were originally dimpled because dimpled caps were found to be more effective in initiating high explosives. (A dimpled blasting cap is itself a miniature shaped charge.)[18,19]

With respect to the latter, one should remember that propellants consist of high explosives that have been blended or bound together so that they will decompose at a controlled rate on the surfaces of the propellant grains.[20] If the grains are pulverized by jet impact such as described for aluminum, then they



This is one of several types of Japanese World War II aircraft that were used to deliver clusters of shaped-charge antitank bomblets like those shown on page 60.

will produce similar effects except that they do not have to be mixed with air and impacted initially as hard or against a second surface.[21,22]

Furthermore, the explosion can be quickly propagated throughout the propellant charge unless it is quenched by some extinguishing agent. This quenching is supposedly provided in the *Chieftain* by a layer of liquid used around the propellant bags.[6] This technique was, however, apparently first introduced in the U. S. *Sherman M-4A3E8* late in World War II when ethylene glycol and/or water was used for "wet stowage."[23]

Although a full discussion of protecting tanks from destruction due to ammunition hits will be reserved for a paper on tank survivability, it should be noted that the shaped-charge jet (or its particles) travels within a relatively narrow path and only ammunition that can be penetrated within this path will be exploded. Thus, a major means of reducing the hazards of ammunition hits by a shaped-charge jet is to locate ammunition low in the vehicle in regions that are rarely hit and penetrated.

The most obvious method of protecting an armored vehicle, its crew, and its components from the effects of a shaped-charge jet is to use an advanced armor. One of the first advanced armors for this purpose was spaced armor. This was formed by using a thin steel plate hung away from the basic armor of the vehicle. For example, the skirt armor on the *Leopard 1, AMX 30,* or the *Vijayata* are current forms of spaced armor.[24,25]

The first common usage of spaced armor to defeat shaped-charge weapons appears to have occurred with the skirt armor (apron armor) used on many German armored vehicles as a part of the uparmoring program started in July 1941.[23,26] The reason for spaced armor effectiveness is shown in figure 3. The early shaped-charge designs lost their ability to penetrate great depths of armor as the standoff between the charge and the principal armor was increased. Modern nonprecision shaped charges can still be affected to some extent; but the performance of precision designs such as the *M-72, LAW, Viper,* and *Dragon* can actually be increased as a result of the additional standoff.

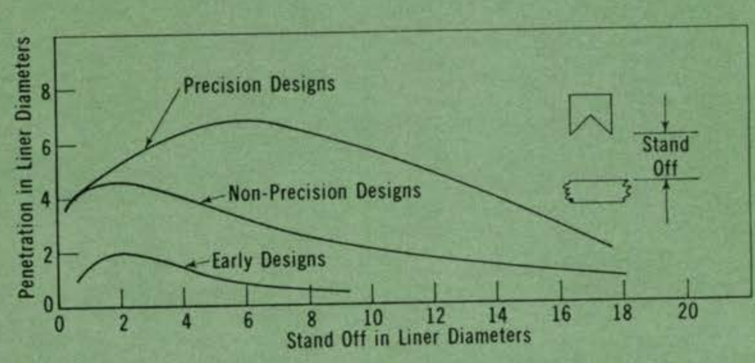


Figure 3. Armor penetration versus stand-off distance for lined shaped charges.

The effectiveness of spaced armor can obviously be increased by filling the space with something for the jet to waste itself against in penetrating. This has been applied to tanks such as the *Centurion, Vijayanta,* Polish and East German *T-54/55,* and the Soviet *T-64* and *T-72* in the form of tool and/or ammunition boxes attached to the turret.[23-25,27,28] Basically, the philosphy of using this filled spaced armor technique can be summarized by noting that it is better to lose noncritical hardware in resisting jet penetration than protecting this hardware inside while allowing the jet to perforate and harm the crew and damage the interior of the tank.

Recently, it has been claimed that laminates of steel, ceramics, and aluminum, of of steels and plastics can be three times as effective against shaped-charge penetration as homogeneous steel armor.[5,6,29-32] Therefore, they must somehow quite obviously disobey the previously discussed penetrations formula by violating one or more of the basic assumptions. However, this discovery is not strange because similar failure of the penetration formula had been well known in mining and oil-well perforation.[33-35]

Since the special materials, such as plastics or ceramics, have lower densities than steel, their usage should usually increase the thickness of the armor arrays.[5] In the turret regions this would lead to a bulkiness such as exhibited by the turrets of the *Leopard 2* and the *XM-1.*[32,36,37] It is, however, very difficult to imagine how this bulkiness could be tolerated in the sides of the hull or around the engine compartment. In these regions it may be more practical to continue using simple skirting plates, though apparently, the *Leopard 2* has incorporated compound armor in even some of these plates.[38-40]

Compound armor (Soviet combined armor) has attracted worldwide interest for both new tank designs[41] and for uparmor appliques.[41-44] This attraction and the possibility of the Soviets not only possessing such technology[30] but also of it already being incorporated in the *T-64,* or *T-72*[45] has caused a certain amount of concern to shaped-charge weapon designers.[46] Clearly, the Soviets have been aware of Western developments for some time.[30,31,47,48] However, as good as compound armors may be,

the designer of shaped-charge weapons has many design factors that can be manipulated to form various jet and slug shapes.[11,12]

Similarly, the designer can even utilize multiple charges aligned one behind the other.[11,49,50] These techniques or just plain overkill by use of very large charges, such as 170-mm diameter,[46] should eventually enable the perforation of the most modern tank armor arrays. Furthermore, the shaped charge can still be used in one of its forms in either bomblets or mines in order to attack lesser-armored regions such as the top and bottom within which compound armors are not likely to be used.[6]

The shaped charge has been an effective armor perforator in the past and may be so again in the future. However, it is constrained in diameter, volume, and weight in order to be compatible with propulsion and guidance components of the antitank munition, just as armored vehicles are constrained in the arrangement of armor by the internal volumes and functions of the crew, gun system, and power plant and drive train. So, it will be very useful to continue the review of shaped charge technology with its weaponization and battle record in the form of grenades, bomblets, mines, projectiles, and antitank guided missiles. ***The next article in the series will continue the discussion of shaped-charge technology.***

Footnotes

[1]A. Ziegler, "Panzerabwehr heute and morgen," *Wehrtechnik*, No. 2, February 1976, pp 22-29.

[2]K. Bellermann, "20 Jahre Lenkwaffen fur die Panzerabwehr," *Wehrtechnik*, No. 2, February 1976, 37-38.

[3]R. M. Ogorkiewicz, "The Next Generation of Battle Tanks," *International Defense Review*, Special Series, *Battle Tanks*, 1976, pp 48-52.

[4]N. Nannig, "Can Western Europe Be Defended by Conventional Means?" *International Defense Review*, Volume 12, No. 1, 1979, pp 27-34.

[5]R. M. Ogorkiewicz, "Latest Trends in Tank Technology," *ARMOR*, May-June 1976, pp 36-44.

[6]R. E. Simpkins, "Tank Warfare: An Analysis of Soviet and NATO Tank Philosophy," Brassey's Publishers Limited, London, or Crane, Russak and Company, Inc., New York, 1979.

[7]J. E. Backofen, Jr., "The Weaponization of Shaped Charge Technology," Proceedings of the Fourth International Symposium on Ballistics, October 17-19, 1978, American Defense Preparedness Association, Washington, D.C.

[8]C. W. Munroe, "The Applications of Explosives," *Popular Science Monthly*, 56, 1900, pp 444-455.

[9]F. Jamet and G. Thomer, "Flash Radiography," Elsevier Scientific Publishing Company, New York, 1976.

[10]H. Schardin, "On the Development of the Shaped Charge," *Wehrtechnische Hefte*, Volume 51, No. 4, 1954, pp 97-120.

[11]W. Trinks, "Shaped Charges and Armor: Their Alternate, Continuous Development," *Jahrbuch der Wehrtechnik*, Folge 8, Wehr and Wissen Verlagagesellschaft mb H, Koblenz/Bonn, pp 154-163, 1973.

[12]M.Held, "Die Projektilbildenden Ladung," Paper F1, 3rd International Symposium on Ballistics, Karlsruhe, W. Germany, March 23-25, 1977.

[13]F. R. Thomanek, "Unsymmetrically Affected Rotational Shaped Charges," paper IV B-4, Proceedings of the 2nd International Symposium on Ballistics, Daytona Beach, Florida, March 9-11, 1976.

[14]P. Caldirola and H. Knoepfel, "Physics of High Energy Density: Course 48, Proceedings of the International School of Physics "Enrico Fermi," "Academic Press, New York 1971.

[15]A. L. Breiter, V. M. Mal'tsev, and E. S. Popov, "Models of Metal Ignition," *Fizika Goreniya i Vzryva*, Volume 13, No. 4, pp 558-570, October-December 1977.

[16]M. Jacobsen, *et. al.*, "Explosibility of Metal Powders," Report of Investigations, No. 6516, Bureau of Mines, U.S. Department of the Interior, 1964.

[17]"Fire Protection Guide on Hazardous Materials," Seventh Edition, National Fire Protection Association, Mass., 1978.

[18]R. W. Wood, "Optical and Physical Effects of High Explosives," *Proceedings*, Royal Society (London), Volume 157A, pp 249-261, 1936.

[19]C. H. Johansson and P. A. Persson, "Detonics of High Explosives," Academic Press, New York, 1970.

[20]T. L. Davis, "The Chemistry of Powder and Explosives," John Wiley and Sons Inc., 1941, New York, Reprinted by Angriff Press, Hollywood, California.

[21]B. D. Trott, J. E. Backofen, Jr., and J. J. White, III, "Design Criteria for Ammunition Storage Compartments," Volume I, Proceedings of the 2nd Symposium on Vulnerability and Survivability, October 1976, American Defense Preparedness Association, Washington, D.C. pp 65-89.

[22]B. D. Trott and J. J. White, III, "Design of Ammunition Storage Compartments," Volume 1, Proceedings of the Fourth Vulnerability and Survivability Symposium, March 14-15, 1979, American Defense Preparedness Association, Washington, D.C.

[23]K. Macksey, "Tank Facts and Feats," The Two Continents Publishing Group, New York, 1974.

[24]F. M. von Senger und Etterlin, "Taschenbuch der Panzer 1976," J. F. Lehmanns Verlag, Muchen, 1976.

[25]F. Kosar, "The 37 Ton Vickers Tank," *Truppendienst*, Volume 9, No. 1, pp 28-29, February 1970.

[26]F. M. von Senger und Etterlin, "German Tanks of World War II," translated by J. Lucas, Galahad Books, New York, 1973.

[27]"Details of the Soviet T-72 Battle Tank," *International Defense Review,*" Volume 10, No. 6, December, 1977, pp 1031-1034.

[28]S. J. Zaloga, "Modern Soviet Armor, Combat Vehicles of the USSR and Warsaw Paçt Today," Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1979.

[29]W. Trinks, W. Geiger, and H. Kollmannsperger, "Grenzen der Schutzwirkung von Panzerwerkstoffen gegen Hohlladungen," *Jahrbuck der Wehrtecknik*, Folge 6, Wehr and Wissen Verlagagesellschaft mb H, Koblenz/Bonn, pp 46-50, 1971.

[30]V. Kovalev, "Tank Defense Problems," *Teknika i Vooruzhenyye*, No. 1, January 1977, pp 14-17.

[31]"Wohin Tendiert die Entwicklung im Panzerbau?," *Militartechnik* 4, 1979, pp 207-209.

[32]S. Tappin, "The Tank Comes into its Own Again: A Look at Recent Developments," *Canadian Defense Quarterly*, Volume 8, No. 4, Spring 1979, pp 16-21.

[33]C. F. Austin, "Lined-Cavity Shaped Charges and Their Use in Rock and Earth Materials," *Bulletin 69*, State Bureau of Mines and Mineral Resources, New Mexico Institute of Mining and Technology, Socorro, New Mexico, 1959.

[34]C. F. Austin and J. K. Pringle, "Detailed Response of Some Rock Targets to Jets from Lined-Cavity Shaped Charges," *Journal of Petroleum Technology*, January 1964, pp 41-49.

[35]C. F. Austin, "Use of Shaped Charges in Mining," *Mining Congress Journal*, July 1964.

[36]Interinfo Forum, *Armies and Weapons* 48, November-December, 1978, p. 67.

[37]C. F. Foss, "Krauss-Maffei, A Study of the Military Programmes," *Defence*, Volume 8, No. 12, pp 786-790.

[38]"Presentation of the Series Production Leopard 2," *Armies and Weapons*, 52, March 1979, pp 26-31.

[39]"Leopard 2 in Series Production," *Armies and Weapons*, 51, February 1979, p 19.

[40]Figure on page 1516, *International Defense Review*, Volume 11, No. 9, 1978.

[41]R. Meller, "NKPz-The Swiss Tank for the 90's?," *International Defense Review*, Volume 12, No. 7, 1979, pp 1079-1081.

[42]"Satory VII," ibid, pp 1203-12.

[43]"Additional Armour for the Israeli Centurions," *Armies and Weapons*, 56, July 1979, p. 30.

[44]"Vickers Mk 4 Battle Tank," *International Defense Review*, Volume 12, No. 9, 1979, pp 1464-1465.

[45]"International Defense Digest—Soviet Special Armor Capabilities Worry NATO," *International Defense Review*, Volume 11, No. 9, P 1373.

[46]"International Defense Digest—IEPG Short-Range Anti-Tank Missile Program Changes," *International Defense Review*, Volume 11, No 4, p 488.

[47]"Improved Chieftain for Iran," *International Defense Review*, Volume 9, No. 4, pp 640-642, August 1976.

[48]A. Kh. Babadzhanyan, "Tanki i Tankovyya Voyska," *Voyennoye Izdatel'stvo*, Ministerstva Oborony SSSR, Moscow, 1970.

[49]W. Kiesshauer, "Trends in the Development of Artillery Shells," *Militartechnik*, No. 8, 1972, pp 340-343.

[50]J. Grexa and J. Smolik, "Projectile or Armor," *Atom*, No. 11, November 1975, pp 328-330.

[51]K. Blagoev, "Projectiles with Dual Shaped Charges, "*Voenna Tehnika*, No 8, 1973, pp 26 and 27.

JOSEPH E. BACKOFEN, JR. was commissioned in the Corps of Engineers upon graduation from the Polytechnic Institute of Brooklyn in 1966. While with the 62d engineer Battalion, his service included Rome Plow Land Clearing Operations in Cambodia and Vietnam. Mr. Backofen is currently involved with the development of advanced weapons technology at Battelle Columbus Laboratories.

PROFESSIONAL THOUGHTS

Nuclear Rounds for Tanks

The opinions and proposals presented in this article are those of the author and do not represent official policy, thinking, or endorsement by any agency of the U.S. Army.

The success of the active defense against the penetration attack depends on the quick destruction of heavily massed, rapidly advancing armored formations by badly outnumbered friendly forces. It is possible that an *M-60A2* tank firing a slightly modified 155-mm nuclear projectile from its gun-launcher would give us another means of accomplishing the dramatic destruction of massed armored hoardes. While the "nuclear hand-grenade" is an old joke without much practicality, the nuclear tank deserves careful consideration.

The Concept

The nuclear battlefield task of immediate incapacitation of enemy crews requires 8,000 rad inside enemy armor.[1] Because of the relatively thin armor on the top of armored vehicles, a low airburst is particularly effective. It is well known that distance substantially reduces immediate radiation. Because immediate radiation is reduced both by distance and by attenuation by a tank's thick frontal armor, it should be feasible for a tank crew to survive the radiation from a nuclear round fired at attacking enemy tanks massed at ranges beyond 1,500 meters.

The Modified Projectile

Without affecting the integrity of the weapon, a 155-mm howitzer projectile could be milled 1.5-mm to produce a 152-mm projectile. Probably, only the bore-riding and obdurating bands need to be machined. In length, the 155-mm projectile, for example the *XM-454,* is less than 35 inches long.[2] Addition of a propellant section less than 10 inches long would result in a complete round less than 45 inches long. The *M-60A2* tank is designed to fire a missile over 45 inches long,[3] so the modified weapon would fit in the breech. As in the case of the conventional 152-mm projectile, gas loss down the missile keyway should be insignificant.

Ballistics

The *M-60A2* 152-mm gun-launcher normally fires a 42.8-lb HEAT[4] projectile at a muzzle velocity of 2,240 ft per sec.[5] If a similar impulse can be delivered to the modified *XM-454* projectile, weighing 120.45 lb,[6] the projectile's muzzle velocity would be about 800 ft per sec. (Calculation details are beyond the scope of this paper.) Figure 1 gives a reasonable, conservative approximation of the expected ranges both for graze and 100-m height-of-burst (HOB) ranges. As shown in the figure, an elevation angle of 355.6 mils gives a 100-m HOB at 2,992 meters. For a tank backed down a small incline or sitting on a hill, greater ranges are possible.

After preparation of the weapon, the tank commander ranges on the center of the target. The range is compared to a firing table to determine fuze and super-elevation settings. Meteorological data and calculations are immaterial due to the short range. After super-elevation is manually or automatically added to the gun-target elevation angle, the weapon is fired. Because the projectile is unguided, the only fire control equipment required for firing is the elevation quadrant (or gunner's quadrant) and the rangefinder. In case of a power failure, accurate fire could be achieved by map inspection from prepared positions. The elevation quadrant requires no power.

Direct Fire Advantages

Direct fire is simpler, more accurate, and more devastating against a rapidly moving, even fleeting, target. In spite of the doctrine of package employment, several scenarios exist in which it could be more feasible to destroy massed armored forces with small yield weapons.

Figure 1. Estimated Ballistics Table

Super-elevation Angle	Theoretical Range	Probable Range Graze	Probable Range 100-m HOB
111.1.mils	1,308 m	1,213 m	-
141.8	1,661	1,516	-
174.0	2,025	1,819	-
208.0	2,401	2,122	1,530m
244.2	2,788	2,426	1,990
282.9	3,187	2,728	2,384
324.8	3,599	3,032	2,750
355.8*	3,886	3,241	2,992
371.0	4,024	3,335	3,101
423.1	4,463	3,638	3,441
484.1	4,918	3,942	3,778
561.4	5,393	4,244	4,112

*Maximum elevation of the *M-60A2* tank gun is 355.8 mils.

A rapidly moving armored force might move away from the area of proposed attack during the coordination time and time-of-flight of a weapon fired indirectly. That is not to say that the target force would escape unscathed, but a significant number of armored vehicles might escape the immediate incapacitation area. On a battlefield where high losses may be expected, any surviving enemy force may be critical. Particularly in the case of a penetrating enemy force, even though heavily constrained by collateral damage restrictions, the destruction of that force might be of paramount importance. On a battlefield complicated by intense electronic warfare, the execution of direct fire might be substantially simpler and more effective than indirect fire.

One other aspect of the nuclear tank must be underscored—survivability. On the high intensity battlefield, the tank is the most survivable vehicle. It is entirely fitting that the most survivable weapon system be capable of nuclear fire.

Issues Still To Be Addressed

Even if all of the technical problems can be solved, the implementation of this proposal involves all the concomitant problems of nuclear weapons: nuclear surety programs, con-

[1] U.S. Department of the Army, Field Manual 100-5, *Operations,* 1 July 1976, p. 10-3.
[2] U.S. Department of the Army, FT 155-A1-1, *Firing Tables: Howitzer, Medium Towed: 155-mm, M-114A1 and M-114 Firing Projectile, Atomic XM-454,* 30 November 1965, pp. vi and 9.
[3] U.S. Department of the Army, Technical Manual No. 9-2350-232-10, *Operator's Manual: Tank, Combat, Full Tracked: 152-mm Gun/Launcher, M-60A2 W/E,* Ch 1-3, 13 April 1973, p. 4-15.
[4] U.S. Department of the Army, FT 152-B-1, *Firing Tables: Cannon, 152-mm Gun-Launcher: M-162 on Tank, Combat, Full Tracked 152-mm, M-60A2 Firing Cartridge, 152-mm: HEAT-T-MP, M-409, Cartridge, 152-mm: TP-T, M411A1, Cartridge, 152-mm: Canister, M625,* 20 October 1972, p. 5.
[5] U.S. Department of the Army, Technical Manual No. 43-0001-28, *Army Ammunition Data Sheets for Artillery Ammunition: Guns, Howitzers, Mortars, Recoilless Rifles, and Grenade Launchers,* Ch 1-4, 20 December 1978, p. 2-84.
[6] FT 155-AI-1, p. vii.

trol, release, training, and continual testing. Many issues need to be addressed, such as various task organizations, optimal positioning and dispersal, and command and control on the electronic warfare battlefield. Numerous specific scenarios need to be addressed: e.g., the conventional-nuclear armor task force vs. the airmobile armored division in the landing zone. This proposal does not offer a battle-ready solution by itself. The nuclear tank can only achieve its capability if appropriately integrated with other armored forces.

Conclusion

The nuclear *M-60A2* tank may be one partial solution to the threat associated with the penetration attack. By simply reconfiguring an existing howitzer projectile, it may be feasible to deliver direct nuclear fire on massed armored forces. Because of the difficulty of implementing a relatively simple idea, this proposal should be thoroughly discussed by forward looking armor leaders. To ignore the benefits of this proposal is the modern equivalent of Custer's decision to not take Gatling guns to the Little Bighorn.

VAN B. CUNNINGHAM
Major

Time For Changes to OPMS?

The Chief of Staff of the Army recently decided to extend most battalion and brigade command tours; therefore, until this action can be evaluated empirically, public discussion of its merit is inappropriate. However, as a result of this decision it does seem appropriate to consider several changes to the Officer Personnel Management System (OPMS). Indeed, it may not be possible to gauge accurately the impact of longer command tours unless certain other changes are at least considered.

First among these changes is the creation of a Command Specialty. For reasons which have no doubt been valid at the time, this proposal has previously been rejected. But the situation has changed and the factors that would influence a decision on this proposal have changed. For one, time in grade requirements for promotion to major, lieutenant colonel, and colonel have been reduced in recent years. Before long, it will be about 5 years in each case. Officers selected to command battalions then will spend 2 or 3 of the 5 years they are lieutenant colonels in command. Moreover, since most successful battalion commanders are subsequently selected to attend a senior service college, another year should be subtracted from the 5 years that most will spend in grade. Assuming these trends continue, there won't be enough time for these officers to serve a tour in a second specialty.

The more important issue, however, is what those who are selected to command battalions do beforehand to demonstrate the potential to command effectively. Nearly everyone would agree that they should have relevant troop experience, particularly company command. But how much experience? Determining who has exhibited the potential to command most effectively should be based on an appraisal of more than one company command. So, perhaps there should be formal procedures established to identify officers who should command at company level more than once.

But what should officers who sucessfully command two or more companies do as majors? If they spend all these years in battalions, as S3s and XOs, they may burn out or develop tunnel vision. Nonetheless, there are many people who see these as the only jobs that really prepare an officer to command a battalion. Surely, the officers who really have what it takes to command battalions effectively can learn what they need to learn while serving in a major headquarters with a reserve unit or as an instructor.

This is a critical issue, for while we no longer need a corps of generalists, we do need commanders with a comprehensive understanding of the Army. Moreover, judging from the high quality of our current field grade commanders, we seem to have done well in this regard in the past. The long-term impact of designating a highly specific assignment pattern should be carefully analyzed.

Naturally, not everyone who succeeds in field grade command will be promoted. Yet, because these officers would not have an additional specialty, their subsequent utilization would not be a simple matter. They would be valuable assets. By earmarking key positions on division or higher level staffs we could achieve a beneficial degree of stability and increase the potential for retaining these officers. In short, unless these officers are assigned to jobs in which they continue to contribute, the Army would probably be unable to retain them.

The objection to a Command Specialty that is raised most often is that it would foster the emergence of a privileged elite. This could be a valid concern. By requiring all field grade promotion boards to have attained specialty objectives, however, the potential, either real or perceived, for this problem would be reduced. Promoting by specialty would assure that officers are only compared with contemporaries of similar training and experience. It would also provide for the promotion of officers to meet the Army's specific needs and it seems advisable for this reason alone.

The Army's need for highly qualified, experienced specialists was recognized when OPMS was originally formulated. Universal application of the dual specialty concept reduces the degree to which this need can be satisfied without producing significant benefit. What is gained or perhaps more importantly, what is lost, by requiring an automation specialist to serve alternate tours in another specialty? Wouldn't it be more effective to let selected officers work in one specialty for their entire career? This would not cause the whole dual specialty concept to unravel. The need for most officers to develop a second specialty rests on the fact that the number of available troop assignments diminishes progressively as an officer advances in grade. Single tracking a limited number of specialties will not change this fact.

Lastly, the general attitude towards OPMS may need to be revised. Personnel management systems are tools that must facilitate the attainment of organizational objectives. In this regard OPMS is no different. The Army is dynamic, its needs constantly changing, so its support systems cannot be viewed as immutable, nor sacrosanct. When a system's effectiveness can be enhanced, it should be modified. Therefore, should thorough analysis indicate that the Army's effectiveness can be enhanced by either establishing a Command Specialty, promoting by specialty, or limited single tracking, these changes should be made to OPMS.

L. ERICK OHLSSON
Major, Armor

A Rebuttal to "20/20"

The following article presents the opinions of the author and in no way reflects the official policy, thinking, or position of any agency of the U.S. Army. Ed.

In January of this year the American Broadcasting Company's News program "20/20" aired a story on the *XM-1* tank in which they raised questions about the tank's cost and combat effectiveness.

The purpose of this article is to set the record straight. Before I do so, let me make one thing clear. I am not now, nor have I ever been, connected with the development of the *XM-1* tank but I do know a number of persons who are.

The ABC News reporter was a Mr. Dave Marish. A comparison of his presentation with information made available to me by sources who have proved to be reliable reveals the following:

Statement: Marish's opening statement was, "Meet the *XM-1*—it is supposed to be a weapon for wars of the 1980's and beyond—a lot of people are wondering just how effective any tank will be 10 years from now—it is fast becoming the most expensive tank ever built and right now at least, it doesn't work."

Interpretation: Marish alleges, or at least if we want to split hairs on semantics, suggests three things in this mouthful.

- We are buying a weapon system that we might not even need in 10 years;
- We're paying too high a price; and
- It doesn't work, which I guess means that since it is a tank that it cannot move or shoot effectively.

Discussion: Who are those numbers of people who predict the disappearance of the tank from the battlefield in 10 years? They do, in fact, exist, and they have existed ever since World War I ended. Major General Edward Croft, then the Chief of Infantry, stated in 1933, "Personally I doubt very much if in the next war tanks will be able to go charging about the battlefield in the face of antitank weapons no matter how hard we try to overcome inherent weaknesses." The antitank weapons he alluded to were the .50 cal. machinegun and 37-mm guns of his day. I wonder what he would have said in 1940 when the *Blitzkreig* rolled through the low countries; or in 1942, at Kasserine Pass; or in 1944, when the 4th Armored Division swept across France.

Similar statements have been made for the past 50 years by every salesman trying to sell antitank weapons and by almost every Army officer who was trying to get Congress to buy new ones. Back in the sixties, I remember hearing one of our Senators tell off a senior officer who had just predicted the demise of the tank if only the Army could buy a new antitank missile. The Senator's reply was to the effect that, "I have been in the Senate a long time sir. In the late forties, I was told the tank was doomed if we'd buy the 75-mm recoilless rifle (RR), I heard it again before Korea when you wanted the 105-mm RR, and again when it was the 100-mm RR. Next it was the *SS-10,* and again when the *ENTAC* missile was the final answer. I can understand that you need this new missile but for God's sake don't feed me that worn out line that 'with this new weapon the tank will be doomed.'"

It's more important to consider those high-level decision makers who do see a continuing need for the tank on the future battlefield. Certainly, the Russians, West Germans, British, and Israelis do; as do the key decision makers in the U.S. Army and the Department of Defense (DOD).

Marish claims the *XM-1* is rapidly becoming the most expensive tank ever built. There may well be substance to this. I could say that the 1980 automobile is rapidly becoming the most expensive ever built and that today's houses are rapidly becoming the most expensive ever constructed. With today's inflation, what can you buy that's better for less? I should add that I've seen conflicting reports that show the Leopard 2 costing more than the *XM-1,* but I can't state that as a fact.

Marish says that right now the *XM-1* won't work. It's operational tests have shown that it will. The real question is how well or poorly and to answer that we need to look at Marish's more specific allegations.

Allegation: In talking about the tank's fire control system, Marish stated, "In one important test the crew said they could hit better with the automatic system turned off."

Discussion: This is a apparently a true statement. What he *did not say* was that this occurred in a 1976 test of the prototype system. It appears that when Marish got hold of this tasty morsel, he was like a dog with a juicy bone in his mouth. Two months prior to the "20/20" showing Marish alluded to this in a conversation with a DOD official. It was pointed out to him that at least two major engineering changes had been made to the system since then. My sources tell me that he repeatedly tried to confirm that the allegation was still true. One source says that when Marish visited Fort Knox he questioned test personnel on this subject and was told by the *XM-1* crews that it was no longer true. When one officer asked him why he persisted in this, he is alleged to have said, "Look, you have your generals that you have to please and I have my generals!" What hurts is that he not only damned the fire control system on what he must have known, or at least had reason to believe, was out-of-date data; but he showed pictures of the *XM-1* firing through dust and smoke without mentioning that no other tank today has such an improved fire control capability.

Allegation: The survivability of the tank was questioned while a film clip showed the test of the tank detonating a mine.

Discussion: The presentation was dramatic to say the least. The size of the mine was such that it would have probably destroyed any other tank in the world. What Marish *did not say,* nor did 20/20 show, was that not only did the *XM-1* survive the blast but that the crew was able to effect repairs in the field and drive the tank away under its own power in less than 4 hours after the detonation. Moreover, the tank continued in operation for over 2 weeks before being repaired by support maintenance.

Allegation: Marish stated that due to the weight of its new frontal armor the *XM-1* designers had to sacrifice armor protection on the flanks and rear. According to him its armor is weaker in those areas than the *M-60* tank.

Discussion: This is simply a wild distortion. The *XM-1* has better flank and rear protection than the *M-60.*

Allegation: Marish stated the Army actually wanted the diesel tank but higher-ups forced the turbine on them.

Discussion: When the General Motors (GM) prototype with

a diesel engine and the Chrysler with turbine engine underwent a competitive test, the Army's source-selection team favored a turbine engine, but by the rules of the source-selection process the GM tank was judged the winner. Both tanks, however, were judged acceptable. On orders of the Office of Secretary of Defense, a resolicitation was made of both contractors in order to "harmonize" their designs with certain aspects of the *Leopard 2.* Each contractor rebid on the proposed tank with the GM design remaining similar to their prototype model whereas Chrysler came in with significant improvements in design plus a significant reduction in price. Hence, Chrysler won the resolicitation.

Allegation: The turbine is a new (and therefore untried) technology.

Discussion: In fact, both the turbine and the variable compression ratio (VCR) diesel on the GM prototype were contemporary technologies. The Tank Automotive Command (TACOM) initiated development of the VCR diesel in 1960 and the turbine engine in 1961. There have been a number of continuing development programs on the turbine since then, not only by the Army, but by Ford, Chrysler, Allison, and at least one more civilian firm. By comparison, the only programs to develop or use a VCR diesel have been the GM *XM-1,* the Main Battle Tank 70, and the Army's high mobility-agility (HIMAG) experimental vehicle. (See ***ARMOR,*** May-June 1980). The VCR is a complex, highly-stressed engine that may yet have its day, but make no mistake about it, it is truly a new technology.

Allegation: Marish made much to do about dust from the tank's environment being a major problem. One film sequence showed an *XM-1* slowing to a stop in an open, exposed position followed by the crew dismounting to clean the filter.

Discussion: While at Fort Knox, Marish was briefed on the Fort Knox tests which clearly proved that the problem was solved. It is true that earlier tests had disclosed a problem with dust clogging the filters. Cleaning was done with a toilet brush and required 30 minutes to accomplish. The solution was to mount a screen over the filter so that now a routine cleaning during normal maintenance takes only 5 minutes. What has

. . . testers and evaluators followed established, standardized practices in evaluating the tank's reliability. There was no effort made to cheat so that the tank would look better than it was.

the Fort Knox folks burning is that in a spirit of open cooperation they acceded to Marish's request and stopped the tank where he wanted them to, then went through the process of shaking off the air filter's screen—a screen that any trained eye could tell did not need cleaning. "20/20" film editors then spliced the two segments together to give the false illusion that the tank had been forced to stop for this purpose. My sources tell me that Marish was incensed about this piece of film. He wanted the crew to use the old method of using a brush. In short, he wanted to expose problems, not solutions. The facts are that as the cleaners become clogged the engine does not stop but instead gradually loses power. A light on the driver's panel gives early warning so that the filters can be cleaned during regular "at-the-halt" maintenance. One more point. My sources tell me that it is the consensus of experts that a diesel engine is more susceptible to damage from dust than the turbine, but maybe Marish didn't know that.

Allegation: Army "expert" engineers were fired because of their criticism of the turbine engine decision.

Discussion: My sources tell me that these "experts" were fired in 1973. The turbine decision, however, was not made until 1976. Moreover, the two engineers worked in TACOM Systems Analysis Division and not in the *XM-1* Project Office which had been in being only a few months when they were fired. Again according to my sources, the controversy they provoked concerned diesel truck engines and had nothing to do with the *XM-1.* Do you think Marish might have been mislead?

. . . never before has a new tank been so throughly tested by troops in the field prior to its going into production. As an old tankser, . . . I'd take the XM-1 over any tank in the world.

Allegation: Marish cited a Government Accounting Office (GAO) report charging that the Army is "adjusting" figures on reliability to make the tank look better.

Discussion: My sources tell me there was a disagreement between the Army and GAO last year in which the scoring system used to predict reliability based on test data was challenged. The point that was missed by "20/20" is that GAO challenged a scoring system and not an unusual manipulation of numbers made to cover up system failures. In discussions with the GAO the Army rebutted the challenge by stating that its requirements are written so as to be tested and measured by the present system. To make the changes GAO wanted would require not only a new scoring system but a new set of requirement statements. From what I can find out, the testers and evaluators followed established, standardized practices in evaluating the tank's reliability. There was no effort made to cheat so that the tank would look better than it was. Just the opposite, I know for a fact that after the OT II fixes were made, additional extensive reliability testing was conducted at Fort Knox under the watchful eyes of Major General Thomas Lynch and Colonels Frank Day and Jim Pigg. I know these three men very well and the day any one of them would stand still for "covering up" or "cheating" will be the day the Panama Canal freezes over. On second thought, the latter is more probable.

Conclusion: What is certain here is that two pictures of the *XM-1* have been painted, one by "20/20" and the other by the Army. Which is correct? Where does credibility lie? Certainly those of us who have been around for a number of years have seen too many problem systems fielded. There is one major difference between the way the *XM-1* has been developed and any other tank before it and that is the fact that never before has a new tank been so thoroughly tested by troops in the field prior to its going into production. As an old tanker, if I was going into combat again, I can tell you this, I'd take the *XM-1* over any tank in the world. For me, that's the bottom line.

DAVID C. HOLLIDAY
Lieutenant Colonel (Ret), Armor
Elizabethtown, Kentucky

NOTES

Night Vision Goggles

A lightweight, low-cost Holographic One-Tube (HOT) goggle night vision aid is being evaluated by the U.S. Army. The system combines diffraction optics, developed from a process used to make holographic pictures, with a third generation, Army-supplied image intensifier tube. The intensifier tube projects enhanced images of the surroundings on the inside of the HOT goggle's diffraction optic lenses. The wearer is able to see through the lenses if there is a sudden flash or other illumination.

Prime Contractor Selected for MLRS

The U.S. Army has announced that the Vought Corporation has been selected as prime contractor to produce the Multiple Launch Rocket System (MLRS). The selection followed a two-and-one-half year test and validation of the Vought-designed system and a competing design from Boeing Corporation.

The MLRS is a highly-mobile, automatic rocket system, consisting of a tracked carrier based on the chassis and running gear of the *M-2/3* Fighting Vehicles, and a launcher holding two pods containing six rockets each. The rockets are preloaded and sealed in the pods of the container which will have a 10-year storage life without any special protection or maintenance.

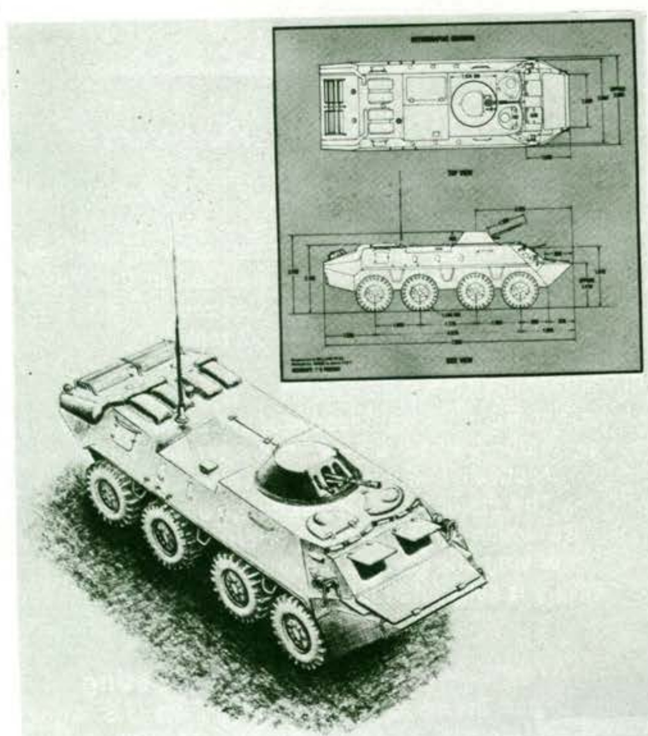
The surface-to-surface rockets of the MLRS have a range of about 30 kilometers (18 miles). Three types of warheads are being considered; dual-purpose antimateriel and antipersonnel munitions, scatterable antitank mines, and guided antitank submunitions. Currently, the dual-purpose warhead is being developed using standard *M-42* submunitions. Each MLRS rocket can carry over 600 *M-42s*, each of which has about the same power as a hand grenade and contains a shaped charge capable of penetrating light armor.

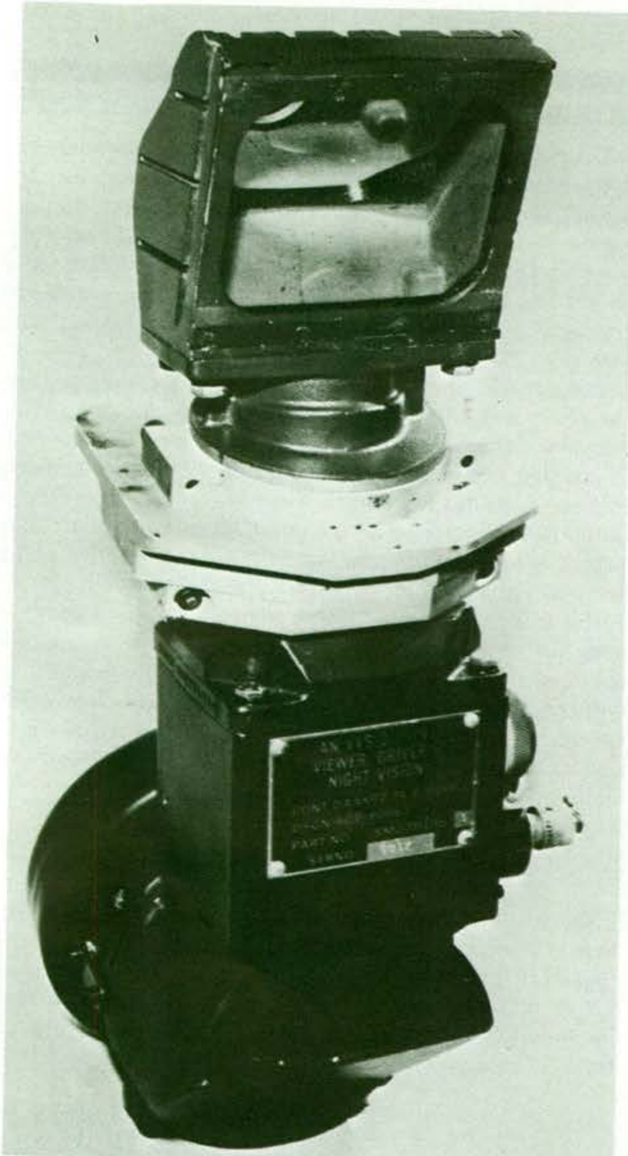
The MLRS system will complement existing artillery systems, and will provide the means for rapidly placing massive, accurate fire on a variety of targets. The launcher is capable of ripple firing from 2 to 12 of the available rockets, with the fire control system automatically repositioning and reaiming the remaining rockets after each shot. Tests have shown that the system can fire the entire load in less than one minute.

The three-man crew is able to occupy a firing position, use the on-board fire control system to calculate and conduct a fire mission, and depart for a new location, all without leaving the cab. The same crew can also rapidly reload the MLRS with 12 more rockets. The two six-pack pod containers can be loaded or unloaded singly or simultaneously.

Soviets Field New Wheeled APC

Recent photographs in the Soviet press indicate that a new wheeled armored personnel carrier is being introduced for the Soviet Forces. The designation is unknown, but is probably the *BTR-70*. It may mount a 14.5 mm machinegun. The dimensions shown in the conceptual drawing are estimates only.





Night Vision Driver Viewers

A contract for 292 *AN/VVS-2(v)1* night vision driver's viewers for the *XM-1* tank has been awarded to Baird Corporation by the Army Electronics Research and Development Command (ERADCOM). Included in the over $2 million contract was a follow-on contract for 500 driver viewers *AN/VVS-2(v)2* for the *M-60* tank.

The *AN/VVS-2* is a second-generation electro-optic device which enables the tank driver to drive at night under closed hatch conditions. Because of this second-generation image intensification device, the operator requires no source of active illumination to see well enough to drive the vehicle. The driver's viewer is equipped with a binocular eyepiece which enhances the performance of the device both in driving and general surveillance.

Delivery is scheduled for early 1982.

Armor Association's 90th Meeting

The United States Armor Association, the U.S. Army's oldest professional organization, held its 90th General Membership Meeting and annual Executive Council Meeting on 15 May 1980 at Fort Knox.

General (Retired) Michael S. Davidson was reelected President, and Lieutenant General (Retired) Donald H. Cowles, Lieutenant General Julius W. Becton, Jr., and Major General Louis C. Wagner, Jr. were elected as Association Vice-Presidents.

In his comments to the Association, General Davidson urged the membership to work towards the establishment of local chapters to promote the professional development of the Armor Force. Chapters have been organized at Forts Knox and Rucker, and Washington, D.C., and presently, an interest has been expressed in forming chapters in the 1st Infantry Division (Forward) and the 3d and 8th Infantry Divisions.

Draper Award Winners

Company A, 3d Battalion, 77th Armor, 5th Infantry Division (Mech), has been presented with the Draper Award for the second consecutive year. The award, recognizing best armor or cavalry unit in the division, was accepted by Captain Thomas Larkin, company commander, who said that much of the credit should go to Captain Mark Hertling, who was in command for almost all of 1979.

Troop G has been presented with the Draper Award, recognizing it as the best unit in 1979 in the 11th Armored Cavalry Regiment. The unit, commanded by Captain John Moncure, demonstrated its preeminence through a variety of evaluations, including Grafenwoehr, AGI and ARTEP evaluations.

Wasp Missile To Find Its Own Targets

An ingenious air-launched missile that will be able to seek out and destroy enemy armor with almost total independence from the launching aircraft is under development for the U.S. Air Force. Called *Wasp* because of its swarm-like attacks on masses of enemy tanks, the missile will have "lock-on after launch" capabilities—meaning that it is not necessary for the flight crew to have seen and designated a target for the missile before it is fired, increasing the chances of survival of the attacking aircraft as it will be able to withdraw before exposing itself to heavy enemy air defenses.

After launch, *Wasp* initially will be programmed to fly to the target area where the enemy armor has been located. A terminal guidance seeker will then take over, identify the armor and steer the *Wasp* to an individual target.

Soviet AK-74 Assault Rifle

The Soviet Union has developed a new, small-caliber version of the tried-and-proven *AKM* rifle which takes advantage of modern technology. Two versions are being produced, a standard stock *AK-74* and a folding stock *AKS-74*. Large-scale issue to units began about 1977.

The major advantages of the *AK-74* over the *AKM* are that it fires a more lethal round; has a greater effective range; and the ammunition is smaller and lighter, providing greater magazine capacity and enabling the soldier to carry more rounds.

Basic Characteristics

Caliber	5.45 mm
Modes of fire	automatic and semiautomatic (has a selector switch like the AKM)
Maximum effective range	about 350 m
Cyclic rate of fire	about 650 rounds/minute (rifle is normally fired in short bursts)
Ammunition	high-velocity ball (somewhat similar to U.S. M-16 round)
Magazine capacity	40 rounds
Bayonet	knife/wirecutter (same as the AKM)
Weight of rifle with loaded magazine	about 3.5 kg

AT-4 (Spigot)

The *AT-4* (NATO code-named *Spigot*) is one of the newest antitank guided missiles (ATGM) fielded by the Warsaw Pact. The *AT-4* is a tube-launched, optically-tracked, wire-guided, missile with a probable maximum effective range of 2,000 meters. The hit probability should be 80 to 90 percent. The maximum time of flight to maximum range should be 10 to 12 seconds.

Since the missile is semiautomatically controlled and tube-launched, it should be hard to spot. Armor penetration should be 500-600 mm.

The Soviet *AT-4* antitank missile (right) is similar to the *Milan* and is believed to be the replacement for the ground-mount, or suitcase, *Sagger* in the Warsaw Pact armies. In these photographs, the weapon is being served by a three-man Polish Army crew (below) which consists of a gunner and two assistant gunners who carry two missiles each. The weapon will have increased accuracy, a shorter flight time, and enhanced effectiveness against U.S. armor.

OPMD - EPMD ARMOR

OPMD

The following questions and answers pertaining to the new Officer Evaluation Reporting system are a continuation of an article which appeared in the March-April 1980 issue of ARMOR.

Q. Will senior rater norms or averages be published?

A. No. The new system compares an individual rating to his own tendencies and norms. There is no DA norm. This procedure avoids the problems experienced by all past systems which employed DA wide norms and averages without any consideration of individual rating official tendencies. Furthermore, the purpose of the SRPR is not to compare one senior rater against another but to judge the credibility of his ratings. In addition, it is designed to provide feedback to the senior rater concerning his responsibilities as an evaluation official.

Q. Is the senior rater too far removed to be an effective evaluator of performance?

A. The intent of the senior rater concept is to fix a critical evaluation responsibility on the individual in each rating chain who is at least one level removed from the immediate supervision of the rated officer, *and* yet close enough to the rated officer to be aware of the organizational circumstances surrounding his performance. (In the new system, this individual will often be the previous system's indorser.) By being one level removed from direct supervision, the senior rater has a wider range of officers to consider and compare and is not subject to the inflationary pressures caused by the rater's personal day-to-day relationship with the rated officer. Therefore, the senior rater is more likely to view performance in more objective terms and be less influenced by close personal relationships. It is also important to remember that the senior rater will be able to supplement his personal knowledge of the rated officer with the information the rater has placed on the OER *and* the information provided by the rated officer on the support form.

Q. Why isn't the rater's rating history being profiled?

A. In most cases raters do not rate a sufficient number of officers to establish a meaningful profile-one that indicates rating tendencies or trends. Conversely, the senior rater (often the previous system's indorser) evaluates a sufficient number of officers to establish recognizable rating tendencies and trends. Additionally, the rater's tendency to inflate is greater than that of the senior rater because of his day-to-day personal involvement and relationship with the rated officer. The senior rater, however, is somewhat removed from these rating inflation pressures and has a broad organizational perspective as well as a wider range of officers to consider and compare. Therefore, he is more likely to view performance in terms of actual results achieved as opposed to viewing it from the standpoint of his personal relationship to the rated officer. Thus, evaluative information provided by the senior rater will probably be more objective.

Q. What is the purpose and value of the duty description on the OER?

A. Selection board after-action reports have consistently indicated the importance of the duty description in assessing the performance and potential of an officer. In the past, duty descriptions have often been bland and failed to give an officer credit for the full scope and breadth of his responsibilities. Therefore, one of the basic objectives of the new system is to improve the quality of the duty description and insure selection boards and career managers are cognizant of both the nature and degree of an officer's responsibilities in a particular duty position.

OPMS-USAR

ID Card: DD FORM 2A (Red) For IRR Officers

Requests for ID cards for officers in the Individual Ready Reserve should be sent to Commander, RCPAC, ATTN: AGUZ-PSE, 9700 Page Boulevard, St. Louis, MO 63132. A request from an officer will be followed up with the three mail-outs and mail-backs described here.

- DA Form 428, Application for Identification Card, is sent out on request, to be completed and returned.
- DD Form 2A (Red) is sent out for photo, signature, and finger prints, and returned.
- DA Form 428 is sent out for signature/receipt and returned. DD Form 2A (Red) is sent out completed and laminated to be retained by officer.

If possible, obtain a DA Form 428 form your local USAR Center or nearby U.S. Army installation, complete it, and send it along with your request.

Death Gratuity

Survivors of Reservists who die while on active duty, active-duty-for-training, or inactive-duty training are eligible for a death gratuity of up to $3,000 in addition to the Servicemens' Group Life Insurance benefits. The gratuity is also payable if the soldier dies of a service-connected cause within 120 days

after discharge or release from active-duty-for-training.

The payment equals six times the monthly basic pay, plus special and incentive pays—but not allowances—at the time of death. The amount may not be less than $800 nor more than $3,000. The payment is made as soon as possible after death occurs. Surviving spouses, children, or other designees are eligible.

New Ready Reserve Terminology

The Ready Reserve is divided into the following categories:

- *Selected Reserve Units (SRU):* organized to serve as units upon mobilization.
- *Pretrained Individual Reservists (PIR):* individuals who have completed initial training and are not members of SRUs. These reservists augment Active or Reserve units as fillers or replacements upon mobilization.
- *Ready Reserve Training Pipeline (TP):* consists of all Ready Reservists who have not yet completed initial active duty for training.

There have been numerous changes during the past year in the meaning of various terms applied to the Reserve Components (RC) and USAR officers need to understand the new terms and their applications. The list above is not complete, but USAR Officers need to identify with all of the changes because they are intended to clarify and simplify our understanding and improve management of the Ready Reserve.

New SBP Rules

Families of eligible reservists who died after 1 October 1978, before choosing an option under the Reserve Components Survivor Benefit Plan (SBP) (Public Law 95-397) may now be eligible for an annuity, according to recently announced guidance from the Office of the Secretary of Defense.

Because of the delay in implementing the program, Department of Defense officials believe that a number of eligible reservists may have died before getting a chance to participate. For this reason, the Secretary of Defense has ruled that their survivors are qualified to receive an annuity under the plan.

Survivors are elibile if the reservist:

- Was eligible to participate in the SBP on or after 1 October 1978.
- Died on or after 1 October 1978.
- Did not get a chance to elect an SBP option.
- Did not execute a statement of intent to participate under the deferred annuity plan and had not already declined to participate.

This annuity is available to the late reservist's spouse or children under 18 (under 23 if they are students) if the spouse is also dead. Survivors have the option of receiving a reduced annuity immediately or waiting until the 60th anniversary of the deceased member's birth for full payment.

If the eligible reservist executed a statement of intent before dying, the annuity will be awarded under terms of that intent.

Those who believe that they may be eligible for an annuity should contact the Commander, RCPAC, ATTN: AGUZ-RAS, 9700 Page Boulevard, St. Louis, MO 63132.

Retirement Entitlement

"How much will I get when I retire?" It's a question that few USAR officers are able to answer. Computing retirement points, figuring point value, and the like are tough chores. The Retired Officers' Association, 201 N. Washington Street, Alexandria, VA 22314 has a booklet in print which covers all details of reserve retirement entitlements. The booklet, "Reserve Retirement Benefits," is free.

EPMD

Each day soldiers call or visit the Military Personnel Center (MILPERCEN) to have their assignment instructions changed. Most of them are enroute to new duty stations, and most are disappointed because the must continue to their original destinations.

The soldiers's preference, his career development, and the needs of the Army are considered before an assignment is made. Assignment changes are strictly controlled by AR 614-200 and once assignment instructions are issued, changes are rarely made. The Armor Branch considers assignment changes on a case-by-case basis, with approval based on the assignment priority and needs of the Army. In cases of a compassionate nature, involving severe illness or extreme hardship which can be resolved in a reasonable time (usually one year), an assignment change may be allowed after consideration by the Compassionate Review Board at MILPERCEN.

There are valid reasons for this strict control. The diversion of a soldier from one assignment to another causes the original requisition to go unfilled for several months because of the built-in lead time in the assignment system. Assignments are made as far in advance as possible and instructions are sent to the field in sufficient time to allow the soldier approximately 90-120 days to prepare for the move. If a unit is already critically short of personnel, the problem this presents is evident. Someone will have to do the job of two people.

A soldier can save time and money by visiting his personnel office to determine whether he/she may qualify for consideration of an assignment change for compassionate reasons. Then, if he/she does qualify, the proper paperwork must be initiated at his/her unit far enough in advance to ensure completion of necessary action before the scheduled departure date. Once the soldier is enroute to a new duty station, only an emergency type of situation can effect a change of assignment.

Soldiers at all levels should understand that an oral request, either by telephone or in person, cannot be acted upon. Complete documentation of the circumstances surrounding the request for a change of assignment is necessary.

Local military personnel office personnel are in daily contact MILPERCEN; therefore, they are in the best position to advise the soldier. Quickest results in assignment change can be attained by making the military personnel office the first stop.

BOOKS

PANZER ARMY AFRICA by James Lucas. Presidio Press, San Rafael, California, 1978. 204 pages. $12.00.

Much has been published about Rommel and the Africa Corps but this book adds a new dimension. It is written from the German viewpoint by an Englishman who served with the British forces in North Africa.

He has drawn principally on German publications about the African Campaign, original military reports and interviews with numerous participants on the Axis side. However, I was surprised that those works listed under Select Bibliography did not include Liddell Hart's "The Rommel Papers" which must be the most authoritative report on the engagements of the African Corps.

The book opens with concise background of the prewar Italian interests in Africa centering around Libya, it's oldest colony, which had been conquered in 1912. It then traces Italy's involvement in World War II in Africa. After the almost complete destruction of it's forces at the hands of the British, Hitler decided to come to the aid of his Axis partner Mussolini. The first German elements under General Rommel landed in Tripoli on 11 February 41.

Lucas describes the buildup of the Africa Corps and the subsequent ebb and flow of it's many battles in the desert.

Rommel soon became a legendary figure through his brilliant successes against overwhelming odds, lack of fuel, ammunition and personnel.

He did have the advantage of better tanks and guns particularly the "88" (88-mm dual purpose gun). It is surprising how the British were repeatedly lured into making what the author describes as cavalry charges against a seemingly retiring force only to come up against the devastating fire of a mass of high-velocity, direct-fire, antitank guns. This, of course, also happened subsequently to some units of the U.S. 1st Armored Division in Tunisia.

The excellent tank recovery procedures of the Africa Corps went a long way in compensating for the force's lack of replacements. Lucas's research was very thorough and he gives the number of "runners" (operational vehicles) on both sides after each engagement as well as the personnel casualties.

An interesting disclosure was how the German intercepts of British communications played an important role in the fall of Tobruk and Rommel's victory against the British operation "Crusader."

Lucas writes that following the high water mark of the African Corps drive, when it was stopped at Alam Halfa and El Alamein, the Germans realized that victory was no longer within their grasp. It was just a question of time as to when the African Corps and 5th Panzer Army, operating out of Tunis, would be defeated.

The principal criticism I would have of this otherwise excellent history is the lack of maps or the failure to include on them the names of so many places and features that are mentioned in the text. I believe the number of photographs which fill 32 full pages could have been reduced and some more detailed maps included than the four half page and six full page ones that were published.

In my opinion, most readers will find this an informative and really fascinating story; particularly, if they were participants in any of the actions described.

HENRY E. GARDINER
Bozeman, MT

ATTACKS by Field Marshall Erwin Rommel. Athena Press, Inc., Vienna, Va. 1979. $14.95.

Even the most casual observer is aware of the military genius of Erwin Rommel. *Attacks* provides the reader with a clear insight into the tactical growth of this soldier. Written in 1937, it was first translated and published in the United States by "The Infantry Journal" as *Infantry Attacks* in 1944. Contrary to the following statement on the book jacket "this edition...is the first complete and unabridged edition of the book published in the United States," I found no dramatic difference between the texts. The publisher asserts that "Earlier editions omitted passages potentially embarassing to our allies as well as a large number of drawings and sketch maps. The Army translation understandably suffered also from a hurried wartime effort." This is not entirely factual; only one passage was omitted and a footnote indicates what was edited out of the text. The book has 72 sketches versus the 68 found in the 1944 translation and also 8 drawings that neither lend to not detract from the text. However, the clarity of the sketches is far superior to the 1944 edition and easily definable for the nonmilitary reader.

Should you choose to spend $14.95 you will be rewarded. Combining the best aspects of a traditional history book and a personal diary, it is written in an easy style. The majority of sections conclude with the author's observations of the battle. The use of italics keys the reader to the salient lessons learned.

Journalistically written and well organized, it is a thought-provoking treatise speaking to the commonality of problems that exist even today. Rommel in sharing his experiences has allowed the reader a modicum of involvement not found in many military books. Today, three wars later, the lessons he learned have not changed. *Attacks* concentrates not only on the strategical and tactical issues, but the philosophical and humanistic aspects as well. I highly recommend the book to not only the historian but also to the military leaders of tomorrow.

JERRY EUBANK
Lieutenant Colonel
194th Armored Brigade

From Flintrock to Rifle: Infantry Tactics, 1740-1866, by Steven Ross. Rutherford: Fairleigh Dickinson University Press. 1979.

The book by Steven Ross provides a well-written and incisive summary of the conflicting trends in the infantry tactics from 1740-1866. During this period, European armies experienced a revolution in infantry tactical doctrine.

In 1740, armies resembled machines, since soldiers advanced in inflexible parade-like formations and exchanged volleys at point-blank ranges. More than a century later, the American Civil War demonstrated that tactical flexibility, open formations, individual initiative, and effective firepower would dominate future battlefields.

The author traces the major developments in infantry tactics and demonstrates that tactical adaptation did not occur easily. The changes involved social adaptation as well as technological and military innovations and essential improvements were often obscured or overwhelmed by other ideas or methods. Yet, armies which recognized the need to change and successfully modernized themselves were

usually more successful than their less adaptive and less fortunate rivals.

The value of the book resides less in its contribution to original historical research, than in its insights for professional military readers. The problems of changing tactics and adopting new weapons are not new, military readers can add to their intellectual depth and understanding by studing previous periods of tactical change. In that sense, Steven Ross' book should be of interest to the Army professional.

ROBERT A. DOUGHTY
Major, Armor
HQ, 3d Squadron, 8th Cavalry

THE ASWAN SOLUTION by John Rowe. Doubleday & Co., New York. 1979. 251 pages. $8.95.

David Laker, a Rand Corporation scientist, has been targeted by Miriam Heller, a beautiful Israeli intelligence operative, in an effort to obtain David's invention, a device that jams antiaircraft missiles. This jamming device becomes a central issue in a daring Israeli scheme to capture the Aswan Dam.

John Rowe has done a magnificent job of blending an accurate historical account of Mideastern politics, sociological dynamics, and the results of the recent Camp David accords with lively suspense-packed drama. Rowe's portrayal of the poignant love affair between Laker and the beautiful intelligence agent, Heller, is handled magnificently. Heller's mission of developing a close sexual relationship with this Rand Corporation scientist receives explicit coverage. Heller's task was exacerbated by David Laker's initial indifference to his Jewish heritage, however, through a bizaare set of circumstances, she succeeds in getting David's commitment to the Israeli cause.

A dramatic portrayal of an Arab terrorist episode, complete with torture scenes involving David and Miriam resulted in David's confirmation of his love for Miriam and his total and fanatical commitment to the Israeli cause. Rowe's development of the intrigue surrounding David Laker's return to the Rand Corporation to obtain the antimissile plans and actual "Black Box" was a masterpiece of plausibility reflective of Rowe's intelligence background. At no time does the reader find himself asking the question, "Can this really happen?"

The scientific development of the antimissile device is pursued by Rowe in a slow and uninteresting manner, not representative of the remainder of the book. This section can best be skipped with no pulse loss to the plot.

Rowe picks up the tempo again with a skillful development of the actual assault on the Aswan Dam. He reaches back again into his military background in portraying this combat scenario. The realistic drama, punctuated with vivid prose, leaves one smelling the smoke and tasting the blood of battle. David Laker with "Black Box" in hand plays the key role in thwarting the heavy concentration of surface-to-air missiles and allowing Israeli air power to turn the tide of battle. The drama intensifies once the Israeli commando group has taken the dam and implanted the nuclear bomb. In an effort to lessen the impact of the destruction of the dam, the Egyptians have vacated the flood plain and proceed to call, what they think, is a Israeli bluff. Tension mounts in Tel Aviv as the decision makers wrestle with the issue. Do they set off the bomb, risking international condemnation, or do they reinforce the commando group and hold out? Rowe cleverly builds the suspense right up to the last page.

This book is a fine novel, nicely researched, and one is treated to not only marvelous drama but an erudite historical account of Arab-Israeli dynamics. The story flows smoothly and the tempo is fast and exciting. Characterizations are skillfully developed enabling one to empathize with ease.

RICHARD P. VANDE HEI
Lieutenant Colonel

THE PLUMBAT AFFAIR, by Elaine Davenport, Paul Eddy, and Peter Gillman. J. B. Lippincott Co., Philadelphia, PA. 1978. 192 pages. $8.95.

Aficionados of spy stories, students of the secret services and those who follow the problem of nuclear proliferation will find something of interest in this fascinating, popularly written book. The book takes its name from the word "PLUMBAT" which was stenciled on some 560 metal drums of yellow-cake—i.e. processed uranium—which were awaiting loading/aboard the *Scheersberg A,* a merchant ship, at the Belgian port of Olen in November 1968. *The Plumbat Affair* is the story of the diversion of those drums, containing some 200 tons of uranium, on the high seas in December 1968 by agents of the Israeli secret service, Mossad. But this book is much more. It is also an engrossing chronicle of a series of Mossad operations; several that succeeded (including the December 1969 Cherbourg episode, which saw the "liberation" of three Israeli-purchased gunboats that had been embargoed by the French), and one that failed and led to the public disclosure of *The Plumbat Affair.*

In July 1973, an Israeli agent was arrested in Olso, Norway, under suspicion for the murder-assassination of a man believed to be Ali Hassan Salamah, a Black September terrorist thought to have played a key role in the Munich Olympics massacre. The murder was yet another in a series of assassinations and counterassassinations which might be called the "secret Arab-Israell war". This Mossad operat was different, however, because arrests were made, the victim turned out to be an innocent Arab, and an agent talked. Reportedly the operative discussed his connection with Mossad, and apparently to convince a skeptical investigator said that he had once owned a ship, the *Scheersberg A.* "So what?" asked the inspector. The reply: "It carried the uranium to Israel." The admission confirmed what had long been suspected, but that previous investigations had failed to prove.

Where all of this fits in the pattern of the Israeli nuclear program is still to be established. Unlike the authors' detailed story of the diversion of the uranium (based we should add on some 200 interviews), we have very little information on nuclear developments within Israel. Nonetheless *The Plumbat Affair* certainly makes it harder to be an agnostic on the prospect of Israeli nuclear weapons, since the yellowcake would be a significant feedstock for the Israeli Dimona reactor (although several significant technical puzzles remain).

In any event, the authors have unearthed a real wealth of information on a subject that is often obscured by secrecy. While this book contains a few technical errors and dubious interpretations of fact, its minor shortcomings do not detract from the book as a whole. *The Plumbat Affair* is a "quick-read" and few readers will be disappointed with the rewards of a few hours reading. Fact is indeed more fascinating than fiction.

AUGUSTUS R. NORTON
Major
Armed Forces Staff College

THE MYTH OF VICTORY: WHAT IS VICTORY IN WAR? by Richard Hobbs. Westview Press, Boulder, Colorado. Price unknown. 566 pages. Notes.

For years soldiers have generally believed in General MacArthur's dictum: "There is no substitute for victory." Buth the problem—and, in recent conflicts particularly, it has been a very obvious dilemma—lies in determining just what constitutes victory. In perhaps a carryover from ancient days when wars were fought by armies with relatively lit-

tle impact on the nations involved (except for those unfortunate citizens who found themselves on the battlefield), soldiers tended to think of victory in finite black and white terms; one side won, one side lost, and everyone went back home to pick up where they'd left off.

As whole populations became increasingly entangled in hostilities, however, this concept of victory became blurred. Since World War II, hostilities around the world have demonstrated that winning is a slippery, amorphous thing, seen differently by eacch viewer. The threat of nuclear conflict has further emphasized that the differences between winning and losing may be indistinguishable. Thus nations are faced with the tough problem of whether waging war is worth the increasing cost.

Richar Hobbs, soldier, scholar, and State Department advisor, has taken a long, detailed look at this dilemma. He examines the growth of the idea of total war and total victory through history, and how the cost of such wars gradually escalated. World War II's Allied demand for unconditional surrender is reviewed extensively, from the formulation of that policy and its effect on the Axis Powers to its ultimate impact on ending the war and shaping the resultant political arena. The Korean War, the Cold War, and the Vietnam War are each evaluated, and the reshpaing of U.S. concepts of how to conduct wars from both political and military viewpoints is described. Finally, Colonel Hobbs looks at total victory in the nuclear age and what it might mean. He describes the differing concepts of victory held by Communists, Third World nations, and the Free World.

This is a provocative book; the reader finds himself nodding in agreement or arguing with Colonel Hobbs' various points. The book is important because it emphasizes the growing realization and acceptance by military and political leaders that war is a subordinate part of political policy, and that the political objectives must always be kept visible and paramount. It's important because it clearly illustrates that the frustrations faced by commanders in recent hostilities may be, in fact, the way of the future, that political objectives may constrain the full use of available military resourcces, and that the old soldier's view of victory is passe.

The book is not without fault. An excessive reliance on quotations and notes (over 1,400!) and occasional digressions into side issues are distracting. The author raises some tough questions but, in several cases, doesn't respond to them or threats them very casually. This is especially true in the last part of the book where the reader anticipates a fairly rigorous treatment of future conflicts and some carefully considered opinions on thises profound issues, but encounters instead a generally superficial review of this crucial change in beliefs and it potential impact on soldiers.

Nonetheless, this is an important, useful, and solidly researched book on a profound problem that concerns every soldier. It's well worth the reading, if only to provoke our own individual ideas into reexamination.

JOHN R. BYERS
Colonel (Retired)
Alexandria, Va.

Recognition Quiz Answers

1. *British FV 432* (Ambulance). The *FV 432* has been the standard APC with the British mechanized infantry battalion since 1964. In appearance, the *FV 432* is very similar to the American *M-113* APC, except the *FV 432* is constructed of welded steel.

2. *Soviet BTR-50 (PK).* Uses the basic *PT-76* tank chassis and hull, with an armored superstructure. After its introduction, the *BTR-50P* was steadily improved and today is still actively used in the Soviet army. No longer produced and being replaced by *BMP* in the Soviet Army, the *BTR-50P* can, be found in a number of countries around the world.

3. *Soviet PT-76 (76-mm).* This was the first Soviet light tank to enter mass production since WW II. Actually a reconnaissance vehicle, it is now outmoded and is being replaced by the *BMP.* It is widely exported to Middle East, Asia, and Africa.

4. *French AMX 13 (APC).* This I.F.V. is standard equipment for the mechanized infantry in the French Army. Twelve infantrymen can be carried, 10 of them sitting back-to-back down the middle of the vehicle. Large hatches along the sides and top enable the infantry section to use their weapons. A turret, left forward, can be equipped with either a 20-mm (shown) or a 12.7- or 7.62-mm machine gun.

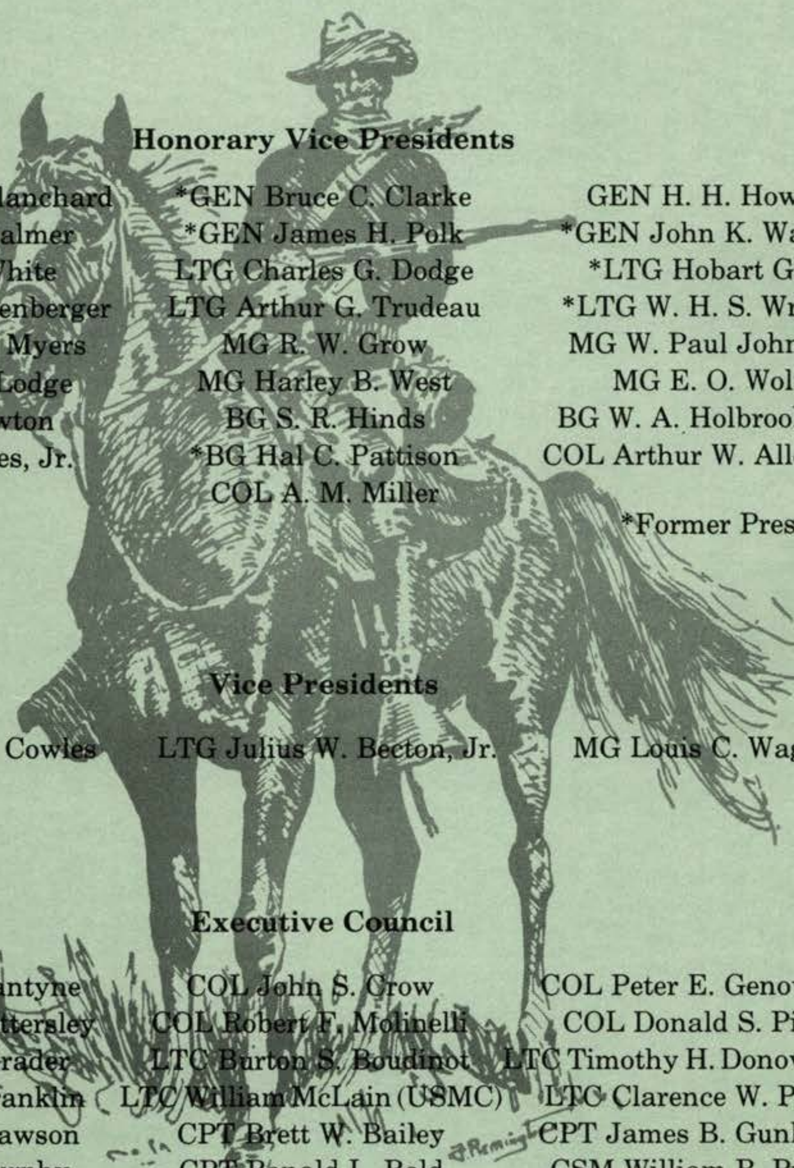
5. *German (FRG) Leopard 2.* The production model uses the *T-20* turret configuration of the *2-AV* prototype, with the Rheinmetal 120-mm smoothbore gun. The vehicle is fitted with stabilization, laser rangefinder, passive sighting system, and 7.62-mm machineguns for coax and AA.

6. *French AMX 10 (HOT).* This is an antitank-missile-equipped variant of the basic *AMX-10* vehicle in service with the French Army. The vehicle is equipped with 20 *HOT* missiles.

This Recognition Quiz prepared by SFC Chris M. Pruitt, Senior Instructor, Master Gunner's Branch, USAARMC. **In answer 1 of the May-June "Recognition Quiz", the Indian *Vijayanta* has the same engine and main gun as the *Centurian,* not the *Chieftain* as given..**

THE UNITED STATES ARMOR ASSOCIATION

Established 1885 as the United States Cavalry Association



1st CAVALRY

(1st Regiment of Dragoons)

Constituted 2 March 1833 in the Regular Army as the United States Regiment of Dragoons. Organized 4 March 1833 at Jefferson Barracks, Missouri. Redesignated 15 May 1836 as 1st Regiment of Dragoons. Redesignated 3 August 1861 as 1st Cavalry.

Assigned to 15th Cavalry Division December 1917—May 1918. Assigned to 1st Cavalry Division 20 August 1921—3 January 1933. Reorganized and redesignated 16 January 1933 as 1st Cavalry, Mechanized.

Redesignated 15 July 1940 as 1st Armored Regiment, Light, and assigned to 1st Armored Division. Regiment (less 2d Battalion) reorganized and redesignated 20 July 1944 as 1st Tank Battalion and remained assigned to 1st Armored Division; 2d Battalion concurrently disbanded.

1st Tank Battalion converted and redesignated 1 May 1946 as 1st Constabulary Squadron; concurrently, relieved from assignment to 1st Armored Division and assigned to 15th Constabulary Regiment. Inactivated 20 December 1948 in Germany; concurrently, relieved from assignment to 15th Constabulary Regiment, converted and redesignated as 1st Medium Tank Battalion and assigned to 1st Armored Division. Activated 7 March 1951 at Fort Hood, Texas. Redesignated 20 May 1953 as 1st Tank Battalion. Inactivated (less Company A) 15 February 1957 at Fort Polk, Louisiana, and relieved from assignment to 1st Armored Division. (Company A concurrently reorganized and redesignated as Headquarters and Headquarters Company, 1st Medium Tank Battalion, 1st Cavalry.)

2d Battalion, 1st Armored Regiment, reconstituted 27 February 1951 in the Regular Army, redesignated as 100th Tank Battalion, and assigned to 1st Armored Division. Activated 7 March 1951 at Fort Hood, Texas. Inactivated 15 February 1957 at Fort Polk, Louisiana, and relieved from assignment to 1st Armored Division.

1st and 100th Tank Battalions consolidated and redesignated 15 February 1957 as 1st Cavalry, a parent regiment under the Combat Arms Regimental System (Headquarters and Headquarters Company, 1st Tank Battalion, redesignated as Headquarters and Headquarters Troop, 1st Cavalry).

1st Cavalry

The regiment was organized in 1833 as the Regiment of United States Dragoons. Many of its officers and men came from the Battalion of Mounted Rangers that had taken part in the Black Hawk War, shown by the crest. The color of the Dragoons was orange, shown by the color of the shield, and the dragon is an allusion to the name Dragoon. The gold eight-pointed star on the encircling belt was the insignia of the Dragoons until 1851.

Campaign Participation Credit

Mexican War
- Buena Vista
- Coahuila 1846
- New Mexico 1846
- New Mexico 1847
- Chihuahua 1848

Indian Wars
- Modocs
- Apaches
- Nez Perces
- Bannocks
- Pine Ridge
- California 1846
- California 1852
- California 1860
- California 1868
- New Mexico 1849
- New Mexico 1850
- New Mexico 1851
- New Mexico 1854
- New Mexico 1855
- New Mexico 1856
- Oregon 1851
- Oregon 1853
- Oregon 1855
- Oregon 1856
- Oregon 1860
- Oregon 1866
- Oregon 1867
- Oregon 1868
- Colorado 1855
- Arizona 1857
- Arizona 1859
- Arizona 1866
- Arizona 1868
- Arizona 1869
- Arizona 1870
- Arizona 1871
- Arizona 1872
- Arizona 1881
- Washington 1858
- Idaho 1879
- Montana 1887

Civil War
- Peninsula
- Antietam
- Fredericksburg
- Chancellorsville
- Gettysburg
- Wilderness
- Spotsylvania
- Cold Harbor
- Petersburg
- Shenandoah
- Appomattox
- New Mexico 1862
- Virginia 1862
- Virginia 1863
- Virginia 1864
- Virginia 1865
- Maryland 1863

War With Spain
- Santiago

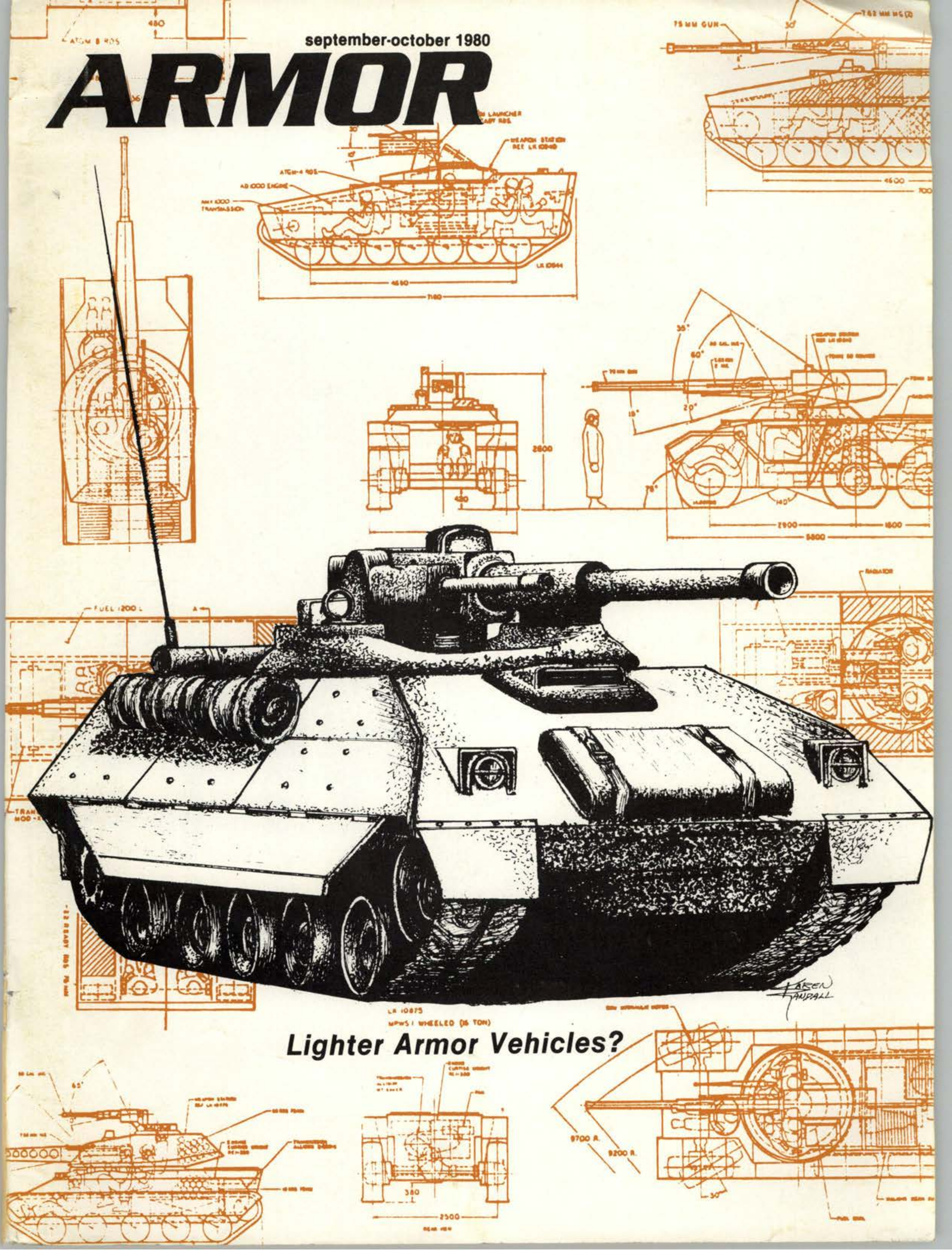
Philippine Insurrection
- Luzon 1901
- Luzon 1902

World War II
- Algeria-French Morocco (with arrowhead)
- Tunisia
- Naples-Foggia
- Anzio
- Rome-Arno
- North Apennines
- Po Valley

Vietnam
- Counteroffensive, Phase III
- Tet Counteroffensive

september-october 1980

ARMOR



Lighter Armor Vehicles?

Commanding General
MG LOUIS C. WAGNER, JR.

Deputy Commanding General
BG JOHN L. BALLANTYNE

Chief of Staff
COL WILLIAM F. COAD

Command Sergeant Major
CSM JOHN W. GILLIS

Deputy for School Activities
COL ROBERT A. PLANT

Deputy for Educational Technology
DR. CHARLES W. JACKSON

Director, Office of Armor Force Management
COL MOWTON L. WARING, JR.

INSTRUCTIONAL DEPARTMENTS

Maintenance
LTC MARTIN L. PLASSMEYR

Command and Staff
LTC WILLIAM R. WILSON

Weapons
COL DONALD L. SMART

Committee Group (BT)
COL CHARLES D. McGAW

NCO Academy/ Drill Sergeant School
CSM BENJAMIN E. PEACHER

DIRECTORATES

Combat Development
COL JIMMY L. PIGG

Training Developments
COL GARY W. BLOEDORN

Armor Aviation
COL ROBERT A. HEFFORD

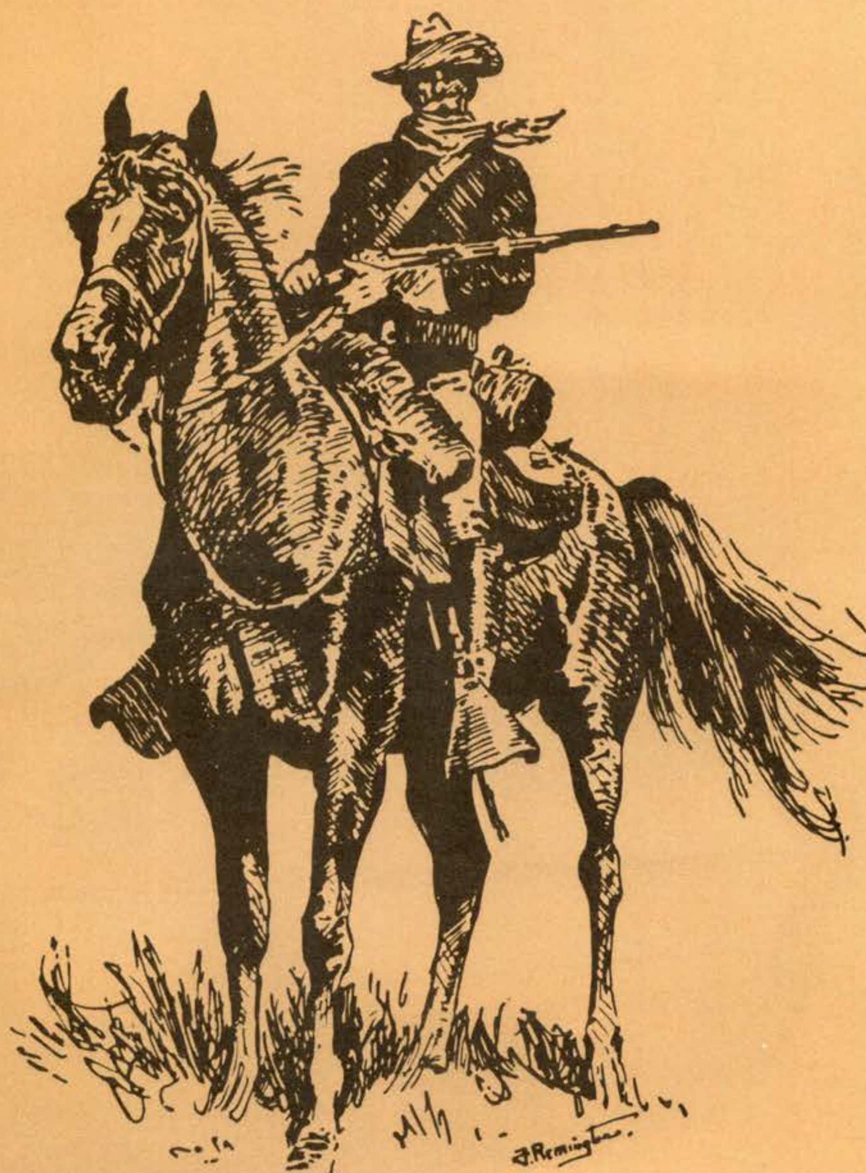
UNITS

The Lightning Brigade
COL ROY C. PRICE, SR.

1st AIT/OSUT Brigade (Armor)
COL ANDREW P. O'MEARA, JR.

4th Training Brigade
COL ERNEST D. JOHNSON

US ARMY ARMOR CENTER and FORT KNOX



"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare; to promote professional improvement of the Armor Community; and to preserve and foster the spirit, the traditions, and the solidarity of Armor in the Army of the United States."

SEPTEMBER-OCTOBER
Vol. LXXXIX, No. 5

ARMOR the Magazine of Mobile Warfare

Editor-in-Chief
LTC FREDERICK W. SHIRLEY

Managing Editor
ROYCE R. TAYLOR, JR.

Assistant Editor
W. RICHARD MORRIS

Art Director
KAREN W. RANDALL

Administrative Assistant
JEANNIE BRIGHT

ARMOR Magazine is published bimonthly by the U.S. Army Armor Center and Fort Knox at 4401 Vine Grove Road, Fort Knox, Kentucky 40121, to stimulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters. Unless otherwise stated, material does not represent official policy, thinking, or endorsement by any agency of the U.S. Army. Use of funds for the printing of this publication have been approved by the Department of the Army, 23 February 1979.

SUBSCRIPTION RATES: Individual subscriptions to **ARMOR** are available through the U.S. Armor Association, Post Office Box O, Fort Knox, Kentucky 40121. **Domestic:** $8.00 one year, $15.00 two years, $22.00 three years. **Foreign:** $10.00 one year, $18.00 two years, $26.00 three years. Single copies, $1.50.

CORRESPONDENCE: Address all correspondence to U.S. Army Armor Center and Fort Knox, ATTN: ATZK-MAG, Fort Knox, Kentucky 40121. (Telephone: AUTOVON 464-2249 or commercial (502) 624-2249.)

POSTMASTER: Controlled circulation postage paid at Indianapolis, Indiana, Department of the Army, DOD 314.

ARMOR may be forwarded to military personnel whose change of address is caused by official orders (except to APO addresses) without payment of additional postage. The subscriber must notify the postmaster.
USPS 464-510

COVER

Light tanks and their design, along with rapid deployment forces, have become popular subjects for discussion recently. A model by LTC (Ret) Burton S. Boudinot of one such design appears on the cover this issue, and articles by LTC Boudinot and others that appear inside continue the discussion.

LETTERS

Realistic Training

Dear Sir:

The article, "Training—One Way", in the January-February 1980 issue, while well written, was hindered by the photograph with the troops in masks. Training needs not only to be integrated, timely, and demanding, but also realistic.

The photograph shows two troops in a simulated chemical attack. The problem is that the attack is simulated. The troops have no overgarments, and to make matters worse, did not even roll down their sleeves. The radio connection adaptors from the *M-25A1* masks are not connected, implying that either the communication gear in the masks is bad or that the troops do not need to communicate in their present situation. Finally, the posture of the troops seems to indicate that they are just sitting, instead of doing their mission. All of this seems to indicate lack of realism in the NBC Training.

Lieutenant Colonel Hardiman was correct when he stated, "training...will not thrive at the hands of junior officers until or unless senior commanders create a healthy environment for training...." This "environment" can be summed up in one phrase—command emphasis. Until commanders get involved, nothing will be accomplished to a great extent. This philosophy can be seen in the NBC programs across the Army. Those programs that are doing well have the command emphasis to back the program. The NBC programs that are not doing well have little or no command emphasis.

With the current world situation we cannot allow our training to be simulated. Take the time to plan good training, and use the equipment that sits in storerooms for IGs. Hands-on realistic training is the only way to train.

LARRY T. RICH
Second Lieutenant, Chemical
Regimental Chemical Officer
3d ACR

Lacks Commo Assets

Dear Sir:

The remarks by Major General Lynch and the "AUTUMN SAFARI Logistics" article in the March-April issue of ***ARMOR*** concerning administrative and logistical operations in a tactical environment motivated this letter.

I agree wholeheartedly that we should reduce the reporting requirements on subordinate headquarters. However, the phrase, "staffs at all levels (must) become proficient at monitoring command nets," scrapes painfully across a sore subject.

The tactical side of the house does an excellent job of providing itself with double and triple net capability. Moreover, it has universally embraced the concept of the stationary tactical operations center as an historical center while the commander roams to the location where he can best see and influence the current situation.

It is an unfortunate fact that too often maneuver battalions lack the physical communications assets to implement a similar organization in their logistical headquarters. They may have the capability in the combat trains, but then not in the field trains. Additionally, if the combat trains monitor battalion command and battalion administration and logistics (A&L) nets then it will often be unable to communicate on the brigade A&L net.

Another aspect of the communications issue is the allocation of secure devices. Tactical units have checkpoints, release points, battle positions, phase lines, and other overlay aids to aid them in clandestine control of the battle. Conversely, there is no easy method for the A&L group to come on the radio and doubletalk their way through a report of wounded, killed, destroyed, and damaged without involving themselves in lengthy encoding and formalized reporting.

In sum, my contention is that each maneuver battalion in the Army today must be provided with the physical assets for:

- A stationary and a mobile CP at both the combat trains and field trains, operated by the S-1, S-4, battalion motor officer, and support platoon leader.
- A mimimum dual-net capability at all four of those locations. The combat trains monitors the battalion command and A&L nets. The field trains monitors the battalion and brigade A&L nets.
- Maneuver companies must have a mobile and stationary CP. The stationary CP must have the capability to send and receive on the company and battalion command nets and the battalion administration and logistics net without leaving any of the three to make reports. Another earlier ***ARMOR*** magazine article illustrated the benefits of this system.

This is a thumbnail sketch, but I think it illuminates the necessary points. Certainly the proper communication assets will not mean a complete end to logistical problems. What it would mean is that the logistics systems would enjoy a dramatic increase in coordination ease, responsiveness, and the provision of timely information. For those purposes I believe that the funds expended for the capability described above would be worthwhile.

I hope you continue to publish articles like those mentioned above which will stimulate discussion and innovation in this area.

LARRY R. BRADLEY
Captain, Infantry

Needs to Catch Up

Dear Sir:

I am writing in response to an inner commitment to renew my membership in the Armor Association. As an Armor officer, no longer assigned to troop units, but assigned to USAOTEA in the Washington, DC area, I realize the value of your magazine for further professional development.

After graduation from AOAC, I spent 18 months at the Naval Postgraduate School in pursuit of a Masters degree in OR/SA. Now being out of the mainstream for nearly 2 years I need to catch up with the evolving doctrine and training programs of the Armor Community. I would much appreciate it if you would send me the necessary forms for membership and subscription.

EDWIN T. CARLSON
Captain, Armor

Glad to oblige. Ed.

How Good Is the *XM-1?*

Dear Sir:

The time is fast approaching when the decision whether or not to proceed with full production of the *XM-1* must be made, and, as both an armor enthusiast and taxpayer I have grave misgivings over whether it is proper to proceed.

Throughout the *XM-1* program, there has been a considerable difference of opinion over the design and reliability of the vehicle between the Army and the General Accounting Office (GAO), so that the interested civilian observer doesn't really know who to believe. Will armored troops receive a tank capable of competing with the *T-72* and its successors, or will they be stuck with another *M-60A2*? The GAO seems to believe the latter, with accusations that the Army "doctored" test results at Ft. Knox, ran inadequate tests at Ft. Bliss and Aberdeen Proving Ground, and had

A Tanker—A Soldier

Time plays games with one's memory, but as I thumbed through pages 35 and 56 of the May-June issue of ***ARMOR,*** old memories spouted forth and some antique adrenalin pulsed once again. For instance, on page 35 you displayed Karen Randall's superb picture of an equally splendid combat-hardened soldier—Sergeant Hobart Drew—a tanker. While he was actually a Technician Fourth Grade, his three stripes, even with a "T," compelled us to call him Sergeant—and we did. During World War II, Sergeant Drew was the driver of an *M-4 Sherman* tank named "Blockbuster." There were three, as time went on, and none made it through the war. These were the command tanks of Company B, 37th Tank Battalion, 4th Armored Division of General Patton's 3d U.S. Army.

Sergeant Drew, a native of Bloomingdale, New Jersey, and his tank led numerous attacks in Alsace-Lorraine and the Saar.

"Blockbuster" was actually named by Second Lieutenant Patrick Donnelly, a former member of the 37th, for whom a Fort Knox firing range is named. He was killed leading a tank platoon of Company A, 37th Tank Battalion in a tank vs. tank action against the 11th Panzer Division at Julivez, France. His successor never saw any reason to change the name of his tank. Sergeant Drew became the driver of "Blockbuster" after its original driver and bow-gunner were killed in another tank vs. tank fight near Ley, France, only a few miles from where Pat Donnelly was killed.

While driving "Blockbuster" the second, in an assault to seize Ober-Gailbach Nieder-Gailbach, Germersheim, and Walsheim (adjoining French and Saar villages), Sergeant Drew's tank was struck suddenly in the final-drive area and disabled by an antitank round. Since "Blockbuster" now had become the center of attention, the Germans laid into it, causing Drew, Corporal John Yaremchuk, and Sergeant Ken Jefferis of his crew to abandon the tank for protection of a nearby doorway. Fragments then struck Sergeant Drew in the left foot and right hip—requiring his evacuation and the end of his part in the war. Now he had a third Purple Heart to display with his Bronze Star Medal and Presidential Unit Citation.

Following the war, Drew moved from New Jersey to Florida as a painting contractor, and was active for many years as a member of the American Legion and the 4th Armored Division Association before his untimely death this past January. He is buried among fellow veterans in the Barrancas National Cemetery at Pensacola, Florida.

We of the 4th Armored Division Association very much appreciated your recognition in the May-June issue of Sergeant Drew and his former battalion commander, General Creighton W. Abrams (World War II commander, 37th Tank Battalion) for whom the new *XM-1 Abrams* Tank is named.

Photograph from which picture in the May-June issue was drawn.

Those who served with them, as I did, while commanding "Blockbuster" and Company B, 37th Tank Battalion, will long remember those courageous tanker-soldiers as our friends and comrades.

You were very thoughtful to send me Karen Randall's superb picture of Sergeant Hobart Drew who was my tank driver during World War II. Since it is the original art, and of such high quality, I would have been remiss, if not selfish, if I had failed to donate the picture to Sergeant Drew's family on behalf of ***ARMOR*** Magazine and the U.S. Armor Association.

JAMES H. LEACH
Colonel, USA Retired
Arlington, VA

to provide extraordinary maintenance just to keep the test vehicles mobile.

Even a casual reading of recent issues of ***ARMOR*** reveals that the *XM-1* is spoken of in nearly uniformly glowing terms. It is portrayed as a credible opponent for current and future Soviet MBTs, powerful, fast, well-armored, and heavily armed. One can even come away convinced that the *XM-1* is a better tank than the latest generation of *Leopards,* a tank which has come closer to being a standard NATO MBT than any other.

Please forgive my critical attitude, but you had better be sure about this tank, gentlemen, for the *T-80* is just around the corner.

ROB STONE
Canton, MI

Mr. Stone's letter was forwarded to Colonel Frank L. Day, Training and Doctrine Command System Manager for the XM-1, for a response. Excerpts of Colonel Day's reply follow. Ed.

Dear Sir:

You are justly concerned as an Armor enthusiast and taxpayer with the *Abrams* tank. It truly represents a significant advance in Armor vehicles and carries an equally significant price tag. That price tag, in today's dollars in excess of $1 million each, is nevertheless a source of some pride to those of us in the program. The *XM-1* development was begun in 1972 with a Congressionally-mandated ceiling of $507,00 per unit cost. By restricting changes to what was clearly necessary and fighting for the most cost effective solutions, the ceiling has not been breached. Unfortunately, it takes more than one million 1980 dollars to match five hundred thousand 1972 dollars.

The reliability of the *XM-1* tank was our major concern from the start of Operational Test II at Fort Bliss, Texas in the summer of 1978 until the end of testing at Fort Knox, Kentucky in December 1979. The program's expectations in the area of Reliability, Availability, Maintainability and Durability (RAM-D), was that we would achieve some 13 specific goals by the fall of 1979. By February 1979, it was apparent that two of them would not be met; mean miles between mission failure and power train durability. In all other RAM-D areas, and indeed all other performance areas, the system met or exceeded expectations. Against goals of 272 mean miles between mission failure and a .5 probability of 4,000 miles between power train rebuild; we had demonstrated only 145 mean miles and .25 probability respectively. The Army, the Department of Defense, the General Accounting Office and Members of Congress were rightly concerned.

The Army and its contractors, Chrysler Corporation, AVCO, Allison, and others, instituted an accelerated program of modification and test and where necessary, remodification. The goal of this program, conducted at Fort Knox for its reliability portion, was to find and fix problems and to test the fixes.

We decided that we had little to learn while the tank was being repaired or modified; the real lessons were to be learned on the test trails. For that reason, we scheduled maintenance for

the third 8-hour shift of every test day—and there were six of these days a week. We decided we had to fix a "down" tank as fast as possible and get it back out on test. This was the only thing "extraordinary" about the maintenance performed during the test. We used all soldier mechanics for organizational-level maintenance as soon as we could complete a 6-week training program for them. We relied on the contractor's mechanics for maintenance support above the organizational level for there were no Army courses ready at that time to train soldiers for direct and general support maintenance tasks on the *XM-1*.

The results were very encouraging. We averaged over 1,000 miles per month and finished the test 6 months early, putting 6,000 miles on each tank. The carefully scored results indicate the tank has demonstrated 326 mean miles between mission failure and a .54 probability of going at least 4,000 miles between power train rebuild. Based on these results and certification of them by Army and Defense officials, Congress gave approval to funding for long lead-time procurements necessary to permit us to make a positive decision next June, following Operational Test III, for full production and deployment of the *XM-1*.

As to the GAO's charge that the Army "doctored" the test results, I take personal and professional offense to this allegation.

What we did is what we always do in a test of this nature and, indeed, what every other reasonable and prudent organization does in order to estimate reliability. Let me give you an example. The *XM-1* program has now accrued over 100,000 test miles, a world record for tank developments by the way. Let us assume that at mile 90,000, a modification was applied to fix a problem that had been causing failures at an average rate of one every 1,000 miles. The system reliability has obviously been improved, but unless the data base is changed, no improvement will show up in the reliability estimate. The data base therfore contains 90 such failures. With no "doctoring" of the data base, we could accrue an additional 80,000 miles without similar failure but would reduce the apparent failure rate due to this now obsolete problem by only 50 percent. Since this is not practical, we delete all but the first failure incident from the count and recompute the expected system reliability, believing this estimate to be more representative of the current performance of the vehicle.

This process does require judgment and is typical of management decisions made under conditions of risk. To alleviate somewhat the chance of poor or perhaps hasty judgment, the rulings are pronounced by a panel of military and civilian government experts representing the system user, developer, materiel tester and operational tester. They examine test results before and after the modification and award the fix an efficiency multiplier that varies from 0.0 to 1.0 depending on how sure they are of the performance of the fix.

Let me sum up what I think to be the current status of the *XM-1* tank:

- To date, the most thorough series of tests ever conducted for a tank development have proved the *XM-1* far superior to any tank the U.S. has every built or tested. This includes the fine *Leopard 2* tank now in production in the Federal Republic of Germany.
- The next series of tests, Operational and Development Test III, will provide us with the knowledge of how best to operate and maintain this tank in combat unit configurations.
- We have an aggressive program of product improvements in development for the tank that are intended to keep the tank's performance competitive well into the next century. This new concept of parallel development of major product improvements for a system not yet in full production promises to reduce the time from technology maturity to system application.
- We do not know very much about the *T-80,* but unless it can "leap tall buildings in a single bound...," the *XM-1* will be able to take it.
- We are sure about this tank, but even if we were not, the *T-80* would still be just around the corner and there is no other alternative tank system as promising for the U.S. Army as the *Abrams*

FRANK L. DAY
Colonel, Armor
TRADOC System Manager

Tank Commanders Urged To Attend Master Gunner Course

Dear Sir:

This letter is to encourage Army National Guard Tank Commanders to apply for the Master Gunner Course.

For me, the course was difficult, yet the total experience was excellent. Armor School instructors offered encouragement and worked extra hours to give additional instruction. In my class, the students conducted many after-hours informal study sessions. Truly it was a group effort.

Back as a "weekend soldier," it has been difficult to help raise the tank gunnery training level within an organization that typically has a high turnover of personnel and is very limited in training time. A Master Gunner, as a team member, does help his unit make progress.

Difficulty characterizes the entire endeavor. However, I encourage other Guardsmen to undertake the challenge. The effort pays off.

CLOYD T. HOOKER
Staff Sergeant, TennARNG
Co D, 1/278 ACR

Stay Behind Armor Unit

Dear Sir:

I enjoyed the May-June 1980 issue very much. The stay behind article was excellent as it sounds like what we need—armored commando units whose troops should also be trained in how to operate Soviet equipment so they can drive back to their own lines in a captured tank or APC, hitting the armor in the rear as they do. The second and third types of stay behind armor units (SBAU) should have some kind of armor-piercing weapon, since they may start to attack a fuel or ammo dump and at that moment a tank or an APC comes in to get refueled or resupplied with ammunition and sees your SBAU and blows them away; or at the very least goes after them and radios that there is an enemy raiding force in the rear area trying to attack the support units. If you don't have at least a LAW or antitank grenade, you are in very big trouble.

Keep up the good work, you're the only ones who are not hung up on branch and service rivalry for funds. (Something which often happens in peacetime).

MICHAEL MOSKOWITZ
Philadelphia, PA

The View From the Bottom

Dear Sir:

General Starry, during his address at the 1980 Armor Conference, accused the combat arm of decision of developing an "air of complacency" and a "ho hum attitude." He further rebuked the Armor Community by stating, "No longer are we sought out as the leading purveyor of new ideas...we lack innovation; we don't suffer well those who do take the initiative."

That may be the view from the top, but the perspective from this side of the fence is considerably different. I wish to remonstrate with a personal perception.

The Division '86 study is a TRADOC force structuring effort initiated by General Starry. Its purpose is to accomodate the U.S. Army to its rapid modernization during the 1980's. The Armor Center recognized this study as a rare opportunity to shape the future and enthusiastically organized a task force dedicated to that purpose.

Major General Lynch, former Armor Center Commander, personally charged the group to throw off the shackles of convention and parochialism and to study the fundamentals of the past in

order to prepare for the future. He further tasked the group to examine the entire integrated battlefield; not one drawn neatly on a map, but a more realistic, nonlinear, "dirty" battlefield.

The Armor Center then proposed what were probably the most innovative alternatives developed within the Division '86 study. These proposals included a heavy brigade (resembling the regimental concept), and air cavalry attack brigade (employing aviation as a true maneuver force and not piecemealed fire support), and brigade support battalions (formalizing the *ad hoc* forward area support teams). Other innovations such as centralized battalion maintenance, realistic field feeding, and true forward service support were championed.

Probably most important, however, was the concept of the combined arms battalion. Today we have no doctrine written for tank companies or tank battalions—we have FM 71-1, *The Tank and Mechanized Infantry Company Team* and FM 71-2, *The Tank and Mechanized Infantry Battalion Task Force.* Army training evaluation programs and field exercises are virtually always performed cross-attached. Everybody *talks* combined arms, everybody *trains* combined arms, everybody knows that we must *fight* combined arms. Why then do we not *structure* combined arms? The answer, we are told, is that the Army is not ready for it.

Few of the proposals mentioned above are neither entirely original nor were they all developed solely by the Armor Center. It was the Armor Center, however, that took the initiative and carried the banner. Some of the ideas survived and are still recognizable in the smoldering remains. Unfortunately, many of them remain impaled upon impenetrable barriers to innovation. Some of these barriers are emplaced at Fort Benning, some at Fort Leavenworth, some at Fort Monroe, with many others elsewhere. These barriers "don't suffer well those who take the initiative."

Is the Armored Force correct in the gospel it preaches? Maybe, maybe not. Does it have an "air of complacency" and a "ho hum attitude?" Well, that is a matter of perspective.

JOHN R. DREBUS
Captain, Armor
Fort Knox, KY

Reserve Training Is Possible

Dear Sir:

Captain John J. Sweeney's article, "Combat Vehicle Training Support," in the May-June issue of ***ARMOR*** adddressed an issue of great significance to the Reserve Component Armor Force. I dare say that nowhere in the Total Armor Force is the disconnect between concurrent development of weapons systems and training systems more apparent than in the Reserve Forces. Given current manpower and funding constraints at the Armor Center, "How to Train" developmental packages for the Reserve are not being adequately addressed. However, Captain Sweeney's statement that Reserve Component training is "an impossible task—now and in the foreseeable future," cannot go unchallenged.

Realistic, effective, mission essential training is not only possible but is occurring on a daily basis within units of the Army National Guard and Army Reserve. The trick is in bringing available resources to bear in a timely and Reserve-oriented manner. To believe otherwise is to admit that Army Readiness and Mobilization Regions, Reserve Component roundout and affiliation agreements, full-time manning and military conversion programs, ARNG and USAR members on extended tours, Reserve Component participation in JRX, MOBEX, LOGEX exercises, and so forth, are exercises in futility. (To say nothing about the thousands of man-years per year devoted to training and planning for training in units.) Such is not the case.

In fact, if Active Component training developers really do believe that the task is an impossible one, I suggest that we have at last uncovered the real problem, the bottom line, which produces lack of understanding, lack of willingness to work the task and lack of awareness of the role the Reserves of the Army occupy in the Total Army wartime structure. Try these figures. In Fiscal 1980, this is how the Reserve Components fit into the US Army's picture.

Total combat increment..........41.5 percent
Non-division combat increment..........59.7 percent
Tactical Support increment..........64.2 percent
Special Theater Forces.............41.1 percent
General Support Forces.............25.5 percent

Individual members of the Active Component should hope that Captain Sweeney's contentions of impossibility are not the case because if they are, mobilization for an action which lasts longer than 2 weeks will likely end in defeat.

We in the Army National Guard and U.S. Army Reserve are dedicated to the proposition that the citizen soldier has always been the backbone of wartime success. We intend to go on breaking our butts to assure that the Reserve Component Force is trained, is ready, and can be mobilized. We solicit the cooperation and assistance of the Active Component in our endeavor to the end that the Total Force can fight and win.

ARTHUR R. MASOERO
Lieutenant Colonel, Armor
USAR Advisor, USAARMC

More on Reserve Training

Dear Sir:

A recent article in ***ARMOR,*** May-June 1980, by Captain John H. Sweeney, titled "Combat Vehicle Training Support" deals briefly with Reserve Component training constraints in a manner that requires comment.

Exception must be taken to Captain Sweeney's statement "Reserve Component training becomes an impossible task—now and in the foreseeable future." With this one statement Captain Sweeney has indicated that as a training developer he has given up on addressing the identification of viable training alternatives to overcome the constraints identified.

I beleive that a closer look at the Reserves would indicate that, even though Captain Sweeney has given up, we are in fact working diligently to develop solutions to our training problems—problems that are in many cases unique due to the environment in which we must exist. It is this uniqueness that training developers such as Captain Sweeney are not willing to deal with when seeking solutions to developing a more ready Armor Force. The SOP seems to be that if Active Component programs don't quite fit just get a bigger hammer and make them fit.

By writing off Reserve training as an impossible task, Captain Sweeney eliminates over 40 armor battalions and 20 cavalry squadrons not to mention the 3 U.S. Army Reserve training divisions and 1 brigade. These units represent a major portion of this Nation's combat power at a time in history when we can ill afford to throw in the towel. Fortunately, not all share this view as evidenced by the assistance being provided by the many dedicated individuals assigned to the three continental U.S. Armies and nine Army Readiness and Mobilization Regions. We had hoped that, possibly, training developers such as Captain Sweeney were in fact exploring ways to provide meaningful assistance; our hopes are in vain and it's business as usual. Historically, the Reserves have met the challenge and we will continue to do so, not because of any assistance we might have received, but rather, in spite of the lack of consideration of our unique training environment by those ultimately charged with developing training strategies for the Total Force.

JON D. MILLER
Major, OHARNG

THE COMMANDER'S HATCH

Louis C. Wagner, Jr.
Commanding General
U.S. Army Armor Center and Fort Knox

The battlefield on which we meet our next enemy almost certainly will not be a "conventional" battlefield. It will be a high-intensity, integrated battlefield where improved conventional munitions, chemical weapons, and tactical nuclear weapons will all be present. Our national policy makes it unlikely that we will have the advantage of first use of chemicals or tactical "nukes"; therefore, we must be prepared to survive their first use by the enemy and still have the capability to retaliate, fight, and win on the integrated battlefield. Technology alone will not provide that capability. We must look at our attitude, leadership, doctrine and tactics, and training for the answers.

Attitude. In the late fifties and early sixties, our commanders habitually trained their units to survive on the nuclear battlefield. Some of the simple things that we practiced with armored vehicles included:

- Orient vehicle to face ground zero.
- Place vehicle in defilade.
- Traverse turret to rear; lock traversing mechanism.
- Turn off radios.
- Remove antenna and disconnect lead-in.
- Close and lock hatch.
- Prepare for blast wave.

We no longer train like that. *Why?* Because we have become so conventionally oriented that our commanders, and as a result our troops, do not believe that tactical nuclear weapons will be employed by either side. This is a dangerous attitude which does not serve us well. Together we must change that attitude. That is the first step toward surviving on the integrated battlefield.

Leadership. We need to educate our new leaders and reeducate our old leaders to the unique demands of the integrated battlefield. We must clearly show that we are prepared to deal with the psychological and physiological stresses of mass casualties, unit isolation, and contamination exposure that are but a few of the complex leadership tasks demanded by chemical-nuclear-conventional battle. Our greatest leadership shortfall is in the area of command awareness of the integrated battlefield challenge.

Doctrine and Tactics. Many bemoan our lack of doctrine for the integrated battlefield, and I agree that we need to make some improvements, but we do not need a new set of "rules." Maneuver will remain the dominant factor on the battlefield, and the coordination of fire support and maneuver will be critical to success. Greater dispersion will be essential, but we must also be able to concentrate forces quickly to counterattack and exploit our own nuclear fires. The *Abrams* tank, along with the CFV and IFV, give us the mobility and firepower to execute these tactics. We must become equally proficient in the three basic missions of *move. . .attack. . .defend,* and we must be able to execute any or all of them in the chemical, nuclear, or conventional environment. As the masters of mounted combat, we must search for new and innovative techniques to survive and win on the integrated battlefield. Individual initiative, coupled with a thorough understanding of the concept of the operation, will be the keys to success.

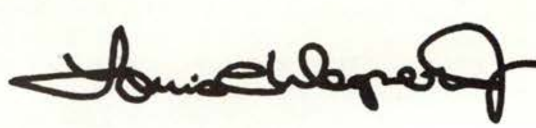
Training. The most important thing that we can do *today* to improve our ability to win on the integrated battlefield is to start training in an integrated environment. Every time a unit leaves the motor pool for field training, that training must be fully integrated. We have to come to grips with the difficult problems of sustaining ourselves in a contaminated environment, not just for 4 to 6 hours, but for at least 24 to 48 hours. The first step is to train to use all the protection that's available. That means placing canvas *on* all vehicles, occupying existing structures for overhead protection from contamination, and actively training in protective overgarments. All of our exercises should include active and passive NBC defensive measures, as well as offensive planning for chemical and nuclear support fires. We must practice logistical operations on the integrated battlefield and become knowledgeable of the degradation in support that will result. We must stop training to fight the way we prefer to fight and start training to fight the way we will have to fight.

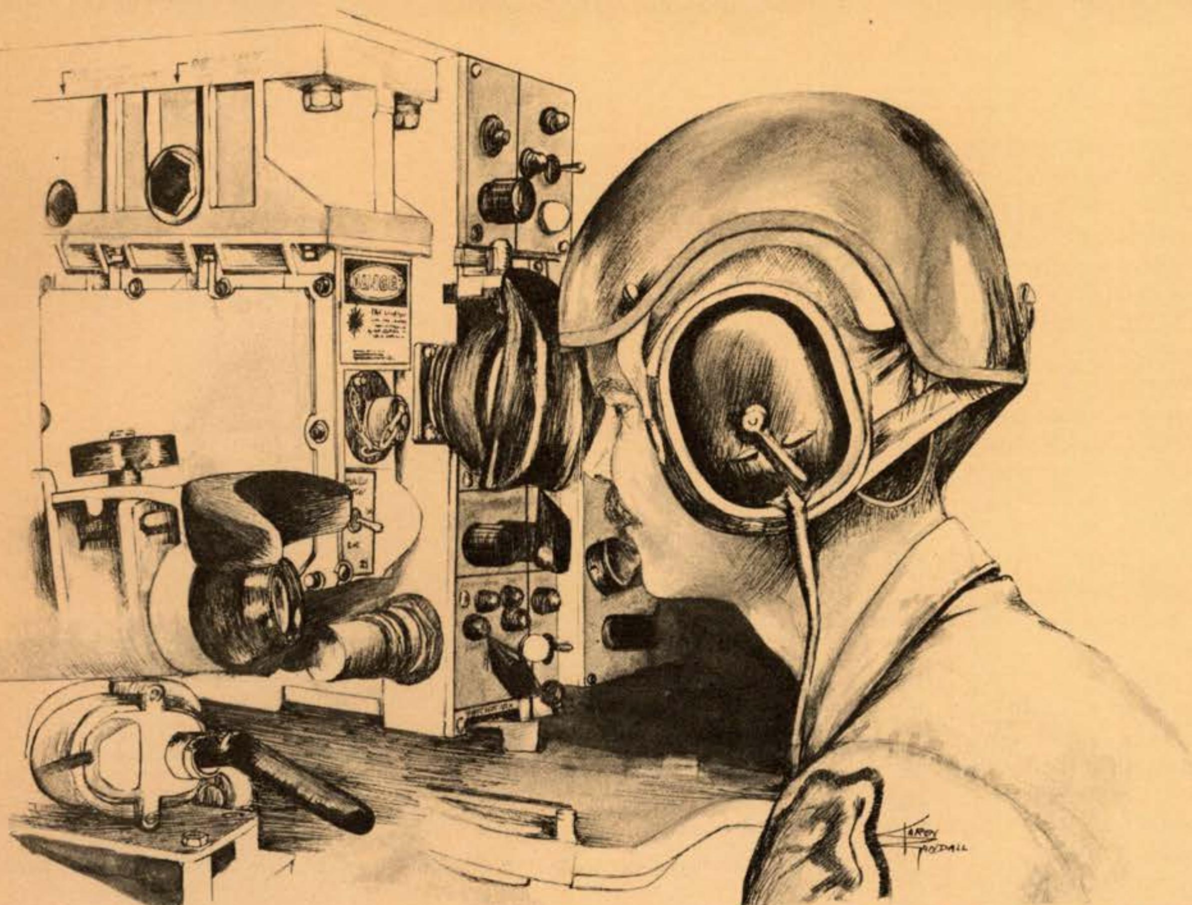
> "If what you practice in your day-to-day exercises makes it clear to the other side that you are vulnerable to being destroyed by first use of nuclear (or chemical) weapons, then you've got some policing up that needs to be done."
> Vice Chief of Staff of the Army, December 79, during the Nuclear Special Program Review.

If there is one clear imperative about tomorrow's increased-lethality war, it is that we must be better equipped, organized, and trained to fight on a battlefield that is populated from the *outset* with a sophisticated array of conventional, nuclear, and chemical weapons as well as an enemy who has far less hesitancy or constraint to employ them to achieve victory.

Our challenge is to face the realities of the integrated battlefield and to apply our collective ingenuity and expertise towards a better way to fight and win on that battlefield. Together, we can do it.

Forge the Thunderbolt!





MASTER GUNNER'S CORNER

With the advent of the *XM-1* tank, the Armor Center has departed from tradition and developed a new criteria for conducting gunnery exercises.

A condensed gunnery program that quickly gets to the "heart of gunnery" has been adopted in favor of firing the traditional Tank Gunnery Tables I through IX, and has been incorporated into Draft FM 17-12-1.

The components of the proposed *XM-1* gunnery exercise are:

- Crew Drill
- Crew Subcaliber Exercise
- Main Gun Exercises
- Crew Combat Evaluation Exercise (CCEE)
- Platoon Qualification Exercise (PQE).

This new approach to gunnery exercises allows a tank crew to enter the gunnery program at their demonstrated level of proficiency instead of forcing trained crews to undergo redundant and time-consuming training they may not need. For example, if a tank crew is still together from their last gunnery at a major training area (MTA), they would not be required to fire the Crew Subcaliber Exercise, but would move to the Subcaliber CCEE, and then to main gun firing.

The practice in the past has been to dry fire and subcaliber fire prior to main gun firing, and this practice will continue; however, dry firing and subcaliber firing will be conducted on different ranges than main gun firing, or as a minimum, target placement will be altered.

With the capability of the Thermal Imaging System (TIS), there is no real difference in day or night engagements; consequently target servicing requirements are relatively the same.

The benefits the commander will derive from this program are savings in ammunition expenditure, reduced time at MTAs, and more control of tank crew training in the unit. All of these benefits will result in increased crewmen interest and morale in gunnery training.

As mentioned earlier, the *XM-1* tank gunnery exercises begin with crew drill. Crew drill in the past has been relegated to a concurrent training role, but now becomes an essential element in the overall tank gunnery training plan. The *XM-1* crew drill as outlined in TC 17-15-14 is designed to train individual crews in target servicing and crew survival on the battlefield. Although the commander has overall responsibility for training, the direct responsibility now is placed in the lap of the platoon leader, platoon sergeant, and tank commander. The *XM-1* crew drills form the basis of not only crew drill, but individual proficiency for tank gunnery, and as such, provide an essential transition to the Crew Subcaliber Exercise.

The Crew Subcaliber Exercise is designed to train tank crews to engage multiple stationary and moving targets while exercising full crew interaction. The Crew Subcaliber Exercise should be fired quarterly at local training areas (LTAs), perferably with full-scale targets. The exercise is divided into two scenarios, stationary (defensive) and moving (offensive). This exercise is dry fired prior to subcaliber firing and, as a minimum, the exercises are fired under the following comditions:

- Normal mode using daylight optics.
- Emergency (battlesight) mode.
- Inoperable gunner's primary sight. (GPS).
- Lead-angle sensor failure.
- Wearing protective mask.
- Normal mode using thermal optics (day and night).

Weak areas identified should be corrected with additional subcaliber firing prior to firing the Crew Combat Evaluation Exercise.

The Crew Combat Evaluation Exercise is an evaluation of the tank crew's ability to engage multiple stationary and

moving targets, both within the offensive and defensive role. Even though this is the first crew main gun firing exercise, the crew must dry fire and subcaliber fire the course initially. If weak areas are found during the subcaliber firing, the crew will make additional runs to correct the deficiencies.

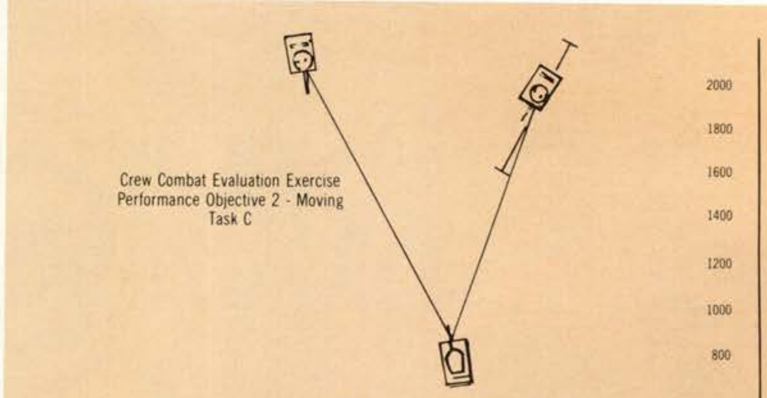
The exercise is in a tactical scenario format. Both during the day and night scenarios, the tank crew will be required to perform at least one of the following tasks:

• Employ smoke.

• Take nuclear, biological, and chemical (NBC) protective measures.

• Engage targets in the degraded mode.

In order for the tank crew to be evaluated as a *Go,* the crew must complete each performance objective task standard satisfactorily and receive 9 of 13 main gun target hits. An example of a Crew Combat Evaluation Exercise task is shown in figure 1.



CREW COMBAT EVALUATION EXERCISE

PERFORMANCE OBJECTIVE 2 - Moving* Day and Night

Tank Crew — Tank: ____ — TC ____ GNR ____ LDR ____ DVR ____ — Platoon: ____ Company: ____ — Date: ____

TASK	CONDITION TARGETS/SITUATION	AMMO	STANDARD	DIAGNOSTIC MEASURES HIT/MISS	TIME	SCORE (Circle Rating)
a. Employ direct fire (multiple engagement)	1 Stat Tank 1200-1400 meters 1 Mvg Tank 1000-1200 meters	2 KE	Target engaged within 16 seconds	Hit/Miss		GO NO GO

Figure 1

The other main gun exercise is the Platoon Qualification Exercise. As the title implies, this is *the* qualification exercise where no single crew is evaluated, rather the entire platoon is evaluated.

This exercise incorporates fire control and distribution of fire with movement and teamwork. There are two performance objectives in the Platoon Qualification Exercise; the Platoon Offensive Battlerun, and the Platoon Defensive Battlerun. The Battlerun will be dry fired and subcaliber fired prior to main gun firing just as required in the CCEE.

NBC and smoke will be incorporated into the scheme of maneuver, and as previously mentioned the night run will be fired in much the same manner as the day phase.

The standards for the PQE are as follows:

Day

• Satisfactorily meet the standards for each task in each performance objective.

• Hit as least 26 of 36 main gun targets.

Night

• Satisfactorily meet the standards for each task in each performance objective.

• Hit at least 18 of 25 main gun targets.

The *XM-1* Tank Firing Tables are a radical departure from our traditional tank tables and will require close planning and supervision with the commander and the unit master gunner.

The development of unit gunnery programs will be much easier to develop and plan under the new Tank Gunnery Training Program giving the commander a better evaluation of his units strengths and weaknesses. For an example of a *XM-1* Annual Tank Gunnery Training Program see figure 2.

Sample
XM-1 Annual Tank Gunnery
Training Program

		1	2	3	4 QUALIFICATION	5	6	7	8 ARTEP	9	10	11	12 SUSTAINMENT
GUNNERY SKILLS TEST		S								S			
CREW DRILL		M	M	M	M	M	M	M	M	M	M	M	M
CREW SUBCALIBER EXERCISE	COFT	M	M	M	M	M	M	M	M	M	M	M	M
	DRY		Q		Q				Q				Q
	SUBCAL		*		S				*				S
CREW COMBAT EVALUATION	DRY				S								S
	SUBCAL				S								S
	MAIN GUN				A								
PLATOON QUALIFICATION EXERCISE	DRY		Q		Q				Q				Q
	SUBCAL		*		S				*				S
	MAIN GUN				S								S
ARTEP	MILES			Q			Q		Q			Q	
	SUBCAL								A**				
	MAIN GUN								A				

M - Monthly Q - Quarterly S - Semi-annual A - Annual

*Fired if laser safe and cal .50 range/LTA available.

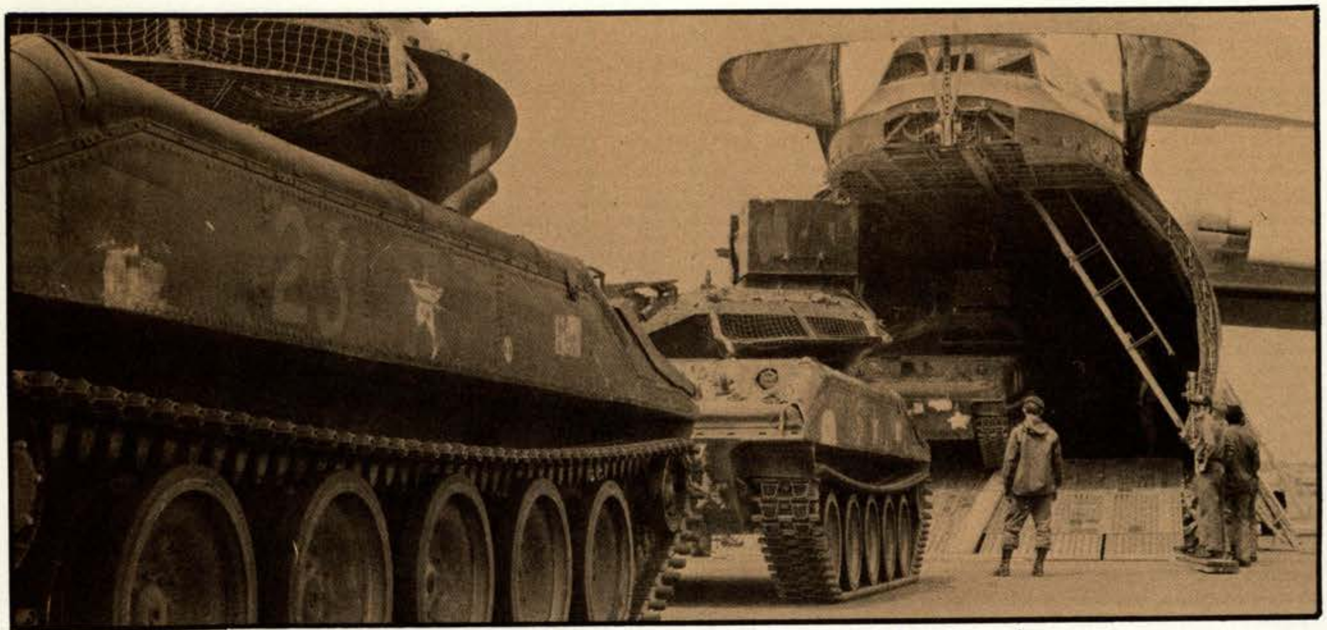
**Fired at LTA if laser safe and cal .50 range capable. If not, ARTEP (Subcal) must be fired at MTA.

Figure 2

Currently, FM 17-12-1 and TC 17-15-14 are in draft form and will undergo validation during OT III for the *XM-1* at Fort Hood this year.

Some of the information we've mentioned in this article is subject to change as a result of OT III, but the concept will form the nucleus of Tank Gunnery Training for the 1980's and 1990's.

LAWRENCE G. MILLER
Sergeant First Class, Senior Instructor
Master Gunner Branch
ROBERT C. SILVA, JR.
Sergeant First Class, Senior Instructor
Master Gunner Branch



Airborne Armor and Cavalry

by Second Lieutenant Thomas D. Dinackus

The most important consideration governing the organization and equipment of the units assigned to an airborne division must be that all elements of the division be capable of swift deployment to support the airborne assault. This means that all units of the airborne division must be as "light" as possible, such that they can be easily deployed by aircraft, and that all units should be capable of parachute assault so that they can be committed to action quickly.

In addition, the units of the airborne division must be equipped so that they require the absolute minimum in logistical support. These peculiar requirements of the airborne division dictate that the Army must not be bound by traditional concepts when organizing the armor branch units of the airborne division. Since the airborne infantry battalions have such a limited amount of motor transport available, the armor and cavalry units of the airborne division perform an absolutely essential function as the mobile units of the airborne task force.

Airborne Armor

Using a strictly theoretical approach, there appears to be great potential in airborne armor units.[1] The goal of all armor formations is to break through into the enemy's vulnerable rear area. Airborne armor could be landed directly in these rear areas, wreaking untold havoc before the enemy could ascertain exactly where and mass his forces against them. Secondly, airborne formations have always been vulnerable to attack by enemy armor. The inclusion of armor in the airborne task force could do much to solve this problem. Unfortunately, the U.S. Army has yet to organize an effective armor element in the airborne division.

Armor was first included in the airborne division in the late 1940's, when each division was authorized over 100 medium tanks. While these vehicles gave the airborne division an excellent antitank and offensive combat capability, no aircraft was in service during this period which could carry them. Hence, the airborne division would have been completely lacking armor support during an airborne operation.

In the late 1950's, the airborne division was reorganized, becoming much lighter. And an air-droppable, armored vehicle, the M-56 "*Scorpion,*" was finally fielded. Each airborne division had 30 *M-56s*, parcelled out six each to the five airborne battle groups. The *M-56* had been designed as an airborne, self-propelled antitank gun; it mounted a 90-mm cannon and had a crew of four and a top speed of 30 mph. Unfortunately, it must rate as one of the worst vehicles ever accepted by the U.S. Army. In an effort to produce an effective airborne, antiarmor weapons systems, a heavy main gun was mounted on a light chassis, and many important components, such as a rangefinder, secondary armament, sophisticated fire control equipment, etc., were all sacrificed. Finally, the vehicle had virtually no armor protection, making the crew extremely vulnerable to enemy small arms and artillery fire and eleminating the possibility of using the *M-56* in an offensive role.

In the late 1960's, a new armored vehicle, the *M-551 "Sheridan,"* entered service. It appeared that the *Sheridan* provided the solution to all of the previous problems with airborne armor. Airborne armor came of age in 1969 when the 4th Battalion, 68th Armor was reequipped with the *M-551* and assigned to the 82d Airborne Division as the world's first and only airborne light armor battalion.

The Sheridan's big advantage over the *M-56* was that it was a true armored vehicle, giving its crew complete protection from small arms fire and shell fragments. Its second apparent big advantage, its revolutionary new armament, was also its biggest drawback. The *Sheridan* was armed with the 152-mm *Shillelagh,* a combination gun and missile launcher which it was hoped would allow a light tank to engage successfully enemy main battle tanks while still being light enough for airborne operations. Unfortunately, the *Shillelagh/Sheridan* combination has been plagued by a multitude of problems. The end result was the decision to replace the *Sheridan* with main battle tanks in armored cavalry units. It has only been retained in the airborne division because no other weapons system currently in the Army's inventory is even remotely suited to the airborne assault vehicle role.

One is forced to conclude that the efforts devoted to producing effective airborne armored vehicles for the United States Army have been a failure. The problem with the *M-56* and *M-551* was that both vehicles sacrificed important factors in order to mount an inordinately heavy main weapon in an effort to produce an air-droppable vehicle which could successfully engage enemy main battle tanks. In short, the antitank role was stressed to the point that the other roles for an armored unit, such as attacking under enemy fire, conducting a pursuit, etc., were sacrificed. This same emphasis on armor as an antitank weapon resulted in the use of nonairtransportable medium tanks in the airborne division in the late 1940's through late 1950's.

Airborne Antiarmor Capability

It should be acknowledged that the airborne division will not be employed against heavy enemy mechanized forces. We must accept the fact that the airborne division, as a specialized unit, has both special capabilities and special weaknesses; one of its weaknesses is a limited antiarmor capability. Hence, we must not demand that its armor units be capable of effectively engaging hordes of first class enemy main battle tanks, since to attempt to reach this goal would be self-defeating. However, it is clear that the airborne division does need an effective antiarmor capability.

The solution is to assign the responsibility for the antiarmor mission to the antiarmor company assigned to each brigade of the 82d Airborne Division. These companies are equipped with the TOW missile mounted on the ¼-ton truck, and are admirably suited to the antiarmor mission for the airborne division. This weapon system's lack of armor protection is not that important, since it is designed to be used strictly defensively.

The second step of the solution is to replace the *Sheridan* with a less complicated armored vehicle mounting a smaller caliber conventional main armament. The resulting vehicle will be less effective as an antitank weapon but will be much more effective as a general purpose armored vehicle. This vehicle should carry a four-man crew, mount a 76-mm or 90-mm gun in a fully-traversable turret and be armored against small arms and artillery fire. It could be either tracked or wheeled. A tracked vehicle would have slightly better cross-country mobility, but a wheeled vehicle would be less complicated. Hence, it would be easier to maintain, faster on roads, quieter in operation, and weigh less.

If the United States would be willing to purchase a major item of equipment from another country, one of the light armored vehicles already in service with our allies could be used to equip American airborne armor units. The following vehicles could all be considered for immediate procurement as the new airborne assault vehicle:

- Belgian *FN* light armored car with 90-mm gun.
- French *AMX-13* light tank—several versions exist. Some with 75-mm and 90-mm guns and some mount antitank guided missiles.
- French *AML-245* light armored car with 90-mm gun.
- French *EBR-75* armored car with 75-mm gun.
- British *Saladin* armored car with 76-mm gun.
- British *Scorpion* reconnaissance tank with 76-mm gun.
- Cadillac Gage "*Commando*" armored car—several versions exist, including one with a 90-mm gun.

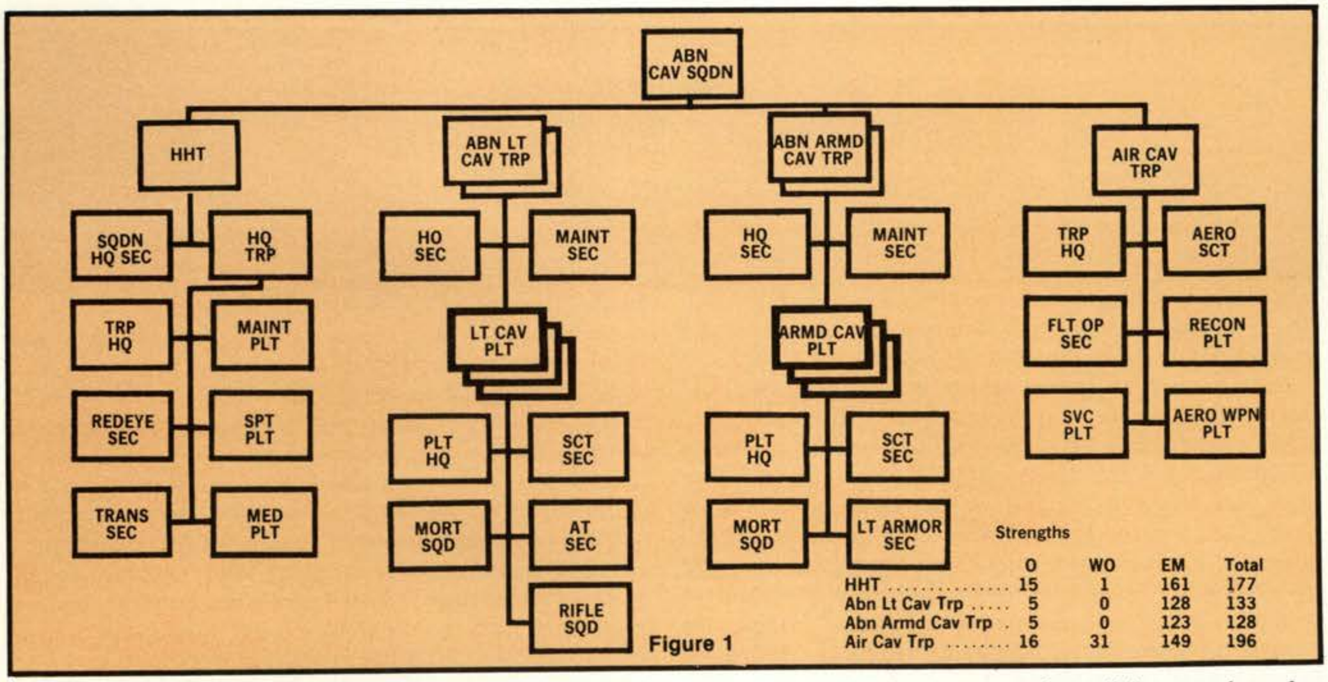
If instead it is decided that we must design our own vehicle, a short term improvement would be the replacement of the 152-mm gun/launcher with a 76-mm or 90-mm cannon in the existing *Sheridans*. In addition, the possibility of externally mounting several antitank guided missiles on the *Sheridan's* turret should be explored.

While the previous discussion of American airborne armored vehicles is anything but a record of worthwhile achievement, it should also be noted that the organization of the airborne, light armor battalion leaves much to be desired. The battalion is currently authorized 33 officers, 2 warrant officers, and 448 enlisted men; with 54 *M-551* Sheridans providing the bulk of its combat power. The battalion consists of a headquarters and headquarters company and three light armor companies.

The problem with the organization of the airborne light armor battalion is that it is strictly a tank unit. Since there is no mechanized infantry within the airborne division, the light armor companies must either be committed without infantry support, thereby violating combined arms doctrine, or the *M-551* must be employed in concert with the foot-mobile, airborne infantry, which would immediately slow the tempo of the attack to the pace of a man. Finally, one has to question whether there is, in any case, the need for a whole airborne, light armor battalion. While the deployment of one company as part of the airborne task force is believable, it is extremely difficult to believe that the entire battalion might be deployed on an airborne assault. What is needed is a combined arms armored unit, fully mounted in light armored vehicles which are capable of parachute delivery—in other words, airborne armored cavalry. A proposal for the reorganization of the airborne division's armor units will follow an evaluation of the division's cavalry units.

Airborne Cavalry

Cavalry formations are crucial to the success of the airborne task force as they perform two important missions. They pro-



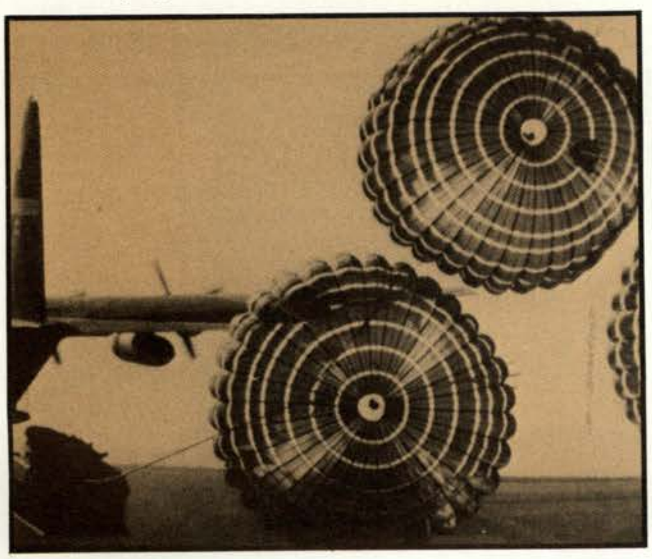
Strengths

	O	WO	EM	Total
HHT	15	1	161	177
Abn Lt Cav Trp	5	0	128	133
Abn Armd Cav Trp	5	0	123	128
Air Cav Trp	16	31	149	196

Figure 1

vide reconnaissance for the airborne commander, who is operating in a completely new area of operations, and they provide security by screening the enemy and giving warning of his approach to the airhead. Thus, it is clear that the airborne cavalry unit must be available to the commander from the first moments of an airborne operation.

Beginning in 1950, each airborne division had a reconnaissance company (later designated troop) assigned which was designed to land by parachute assault with the lead elements of the airborne division. This company was equipped with wheeled vehicles, primarily the ¼-ton truck. In the 1960's, this troop was expanded to a squadron and included an air cavalry troop which enhanced the division's reconnaissance/security capabilities but which could not make a parachute assault, since the helicopters had to be unloaded at an airfield. Up until the early 1970's, the cavalry assets of the airborne division had been organized and equipped properly to deploy swiftly and enter action to perform the cavalry mission for the airborne task force. In late 1972 and early 1973, the 82d Airborne Division's 1st Squadron, 17th Cavalry converted to an air cavalry squadron with a headquarters and headquarters troop, three air cavalry troops, and one light ground cavalry troop. This reorganization was a great mistake.



The squadron is authorized 74 officers, 99 warrant officers, and 740 enlisted men, along with 82 helicopters, and 147 vehicles. The air cavalry troop's helicopters must be dissassembled to be airlifted, cannot be parachute delivered, and must be reassembled before being used; it requires about 4 hours to reassemble four *OH-58s* and 12 hours to reassemble four *AH-1Ss.* Finally, the air cavalry troops would require immense logistical support once they were in operation. The situation became much worse in February 1977 when the 1-17th Cavalry's only element capable of parachute assault, its ground cavalry troop, was inactivated, leaving the squadron with a headquarters and headquarters troop and three air cavalry troops. Clearly, the air cavalry squadron is poorly organized and equipped to be the "eyes and ears" of the airborne division.

The Airborne Cavalry Squadron

The armor and cavalry assets of the airborne division should be reorganized and consolidated into one airborne cavalry squadron (figure 1). Each of the three types of line troops is designed to fulfill a different role.

The light cavalry troop is designed to be as easily deployed as the airborne infantry it supports. Therefore, it uses only light, wheeled vehicles which require minimal logistical support. The proposed troops uses the same organization as is currently authorized for the ground cavalry troop in the airborne division's air cavalry squadron. The airborne, light cavalry troop can make a parachute assault or be airlanded, and is designed to provide the airborne task force commander with the far-reaching reconnaissance and security capability which is absolutely essential during the first hours of an airborne attack and which could only be provided by a mobile unit.

The armored cavalry troop's principal advantage over the light cavalry troop is that all of its vehicles are completely armored, enabling it to engage in sustained mounted combat. In addition to the *Sheridan*,[2] the armored cavalry troop would employ three types of armored fighting vehicles. Two of these, the *M-113A1* armored personnel carrier and the *M-106A1* self-

propelled 4.2-in mortar, are currently in service with the U.S. Army. The third vehicle, to be used by the scouts and the platoon leaders would be the *M-113½ "Lynx"*.

The *Lynx* reconnaissance vehicle is a modified *M-113A1* that has only four roadwheels per side and a redesigned front. It has a three-man crew, a top speed of 44 miles per hour, is amphibious, and can mount different armament combinations, including a 20-mm cannon. The vehicle has been in use by the Canadian and Dutch Armies for years, could easily be integrated into the United States supply system, and has faired quite well in tests conducted by the U.S. Army to compare it with other prospective reconnaissance vehicles.[3] In short, the *Lynx* is the successful reconnaissance vehicle the *M-114* was supposed to be, but never was.

The armored cavalry troop would be employed best to conduct offensive operations, such as spearheading the attack by an airborne infantry battalion, or to serve as the reserve of the airborne task force or as a covering force, especially if a highly active defense was required. Admittedly, the airborne, armored cavalry troop's heavier and more sophisticated equipment would mean that its lift requirements for deployment and logistical support requirements once deployed would be higher than those of the light cavalry troop. However, all of the vehicles used by the armored cavalry troop can be airdropped, making the armored cavalry troop a unit which can quickly enter combat when deployed as part of an airborne task force.

The air cavalry troop's primary advantage is the significantly greater degree of mobility it possesses when compared with the light and armored cavalry troops. However, the time needed to reassemble the helicopters after deployment, coupled with the troop's logistical requirements, dictate that while the air cavalry troop could be very useful during the later stages of an airborne deployment, the troop could not be successfully employed during the first crucial hours of an airborne attack. The proposed troop uses the same organization as is currently authorized for the air cavalry troop in the airborne division's air cavalry squadron.

Command and Control

The last unit of the airborne cavalry squadron to be discussed is the headquarters and headquarters troop. During an airborne operation, this unit would be primarily used as the command and control and support element for the airborne task force's operational reserve. Therefore, it would only deploy on major operations. In such a situation, the headquarters and headquarters troop might be controlling a task force consisting of one light cavalry troop and two armored cavalry troops, or its task force might consist primarily of non-cavalry units. For example, the task force might consist of one armored cavalry troop, two airborne infantry companies and one anti-armor company, while the squadron's other troops operated independently as a covering force. Finally, since the organization of the squadron task force would be flexible, the headquarters troop would be task organized for deployment depending on the command and control, logistics, and combat capabilities required for the specific operation.

As currently organized and equipped, the 82d Airborne Division's airborne, light armor battalion and air cavalry squadron make only a minimal contribution to the airborne combat capability of the division while requiring a disproportionate amount of men and equipment.

In the case of armor units, U.S. Army doctrine has improperly stressed the antiarmor mission above all others, resulting in the procurement of vehicles which could not properly provide the offensive capability to the airborne division which airborne armor should. The solution is to free airborne armor units from their antitank mission, turning this over to the jeep-mounted TOW, and reorganizing airborne armor as airborne armored cavalry—a combined arms, highy mobile, strike force.

In the case of cavalry units, U.S. Army doctrine until recently has properly stressed the lightness required for quick deployment—it is only with the air cavalry squadron of the 1970's that doctrine went astray.

It is time to reassert the importance of light, mobile cavalry units to provide the needed reconnaissance and security for the airborne task force, which can be effectively employed from the first minutes of an airborne assault. By reequipping and restructuring the armor branch units of the airborne division, as outlined, considerable savings in men and material will be realized while increasing the division's ability to deploy quickly on an airborne operation with the optimum force structure to accomplish the mission.

Foot Notes

[1]For example, tank units as opposed to airborne cavalry, will be discussed later in the article.

[2]The proposed TOE depicts the airborne cavalry squadron as it would be if reorganized using equipment currently available.

[3]See LTC James A. Boehme, "Shoppers' Guide to Recon Vehicles" *ARMOR*, January-February 1975, pp. 26-31. Additional information on the *Lynx* and the recon vehicle tests can be found in LTC David L. Funk and CPT Donald C. Snedeker, "Armored Reconnaissance Scout Vehicle Test" *ARMOR*, September-October 1975, pp. 37-42.

SECOND LIEUTENANT THOMAS D. DINACKUS was commissioned in armor through ROTC as a Distinguished Military Graduate from Dickinson College, where he majored in History. Having attended AOB, he is serving as an armored cavalry platoon leader in Troop E, 2/3 ACR.

From M-48A1 to M-48A5

A "New" Tank On the Block

by Cathy Hardman and Bob Black

In 1975 a contract was let to upgrade *M-48A1* tanks to the *M-48A5* configuration. The successful bidder in the competition for the contract—which included two private corporations—was Anniston Army Depot, where 4 years later, in December of 1979, the last of the *M-48A5s* rolled off the assembly line. During those 4½ years, 2,064 modernized tanks were added to the Army's fleet.

In the conversion process, the gun, recoil, fire control, armament, power train, and suspension systems were removed, overhauled, modified, reassembled, and reinstalled. And, as the Depot's management people like to point out, quality is not inspected in—it is built in, with quality inspectors working alongside maintenance people during every step of the process.

The *M-48A5* rebuild process began with destruction. Each old tank was taken apart in the disassembly area of Building 400, the Depot's 5-acre building used for tracked vehicle maintenance. Here the turret and chassis were separated, with the turret going to an adjacent building for further disassembly.

The chassis was completely gutted, becoming nothing more than an empty hull, with even the mountings cut away. Reusable components were sent to other specialty shops in the maintenance area, where each was reworked for later assembly.

To accomodate the diesel engine which replaced the smaller gasoline engine, 578 square inches of new steel was added at each side of the tank, along with top deck and exhaust grilles. Welds—both here and farther along the line—were X-rayed to insure that there were no imperfections.

New brackets and mountings were welded on, and each chassis went onto a giant stub lathe to be machined to a very close tolerance, especially in the area where the huge turret bearing is installed.

After the new fittings came the suspension system—arms, roadwheels, final drive sprocket assembly, compensating idlers, support rollers, and torsion bars.

The it was on—via 40-ton overhead cranes—to the final assembly line, where the guts were installed: engine, transmission, fuel tanks, electrical system, steering, phone boxes—everything the modern tanker might want short of dinner for four.

Then at last come the tracks, after which the hull proceeded under its own power to the turret shop, where it was "married" to the newly-outfitted turret.

While the chassis was being refitted, the turret had also been undergoing its own rebuild procedure to accomodate a newer, more sophisticated fire control system, including daylight and infrared systems for sighting and ranging.

Every lens, mirror and optical window in the periscopes and rangefinding system had been checked for scratches and irregularities in surface flatness. If necessary, they were reground and polished to a surface flatness tolerance of one-millionth of an inch.

After each of the optical fire control items was assembled, it was tested, calibrated, rechecked and recalibrated before being installed in the turret. The same care and testing went into every rebuilt component of the tank.

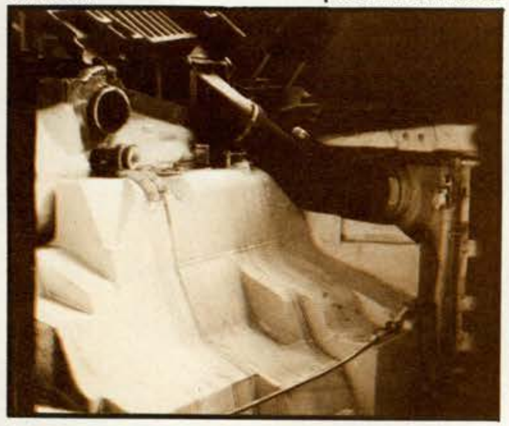
In the turret shop, too, the new 105-mm gun was installed, replacing the old 90-mm gun used in the *M-48A1*. All working parts of the recoil mechanism were checked for wear, received extensive modifications, and were thoroughly tested before being assembled to the new 105-mm gun.

Although the major conversion program began at the Depot in 1975, the idea for the program originated 20 years ago with engineers at the Ordnance Tank Automotive Command—what is now the Tank-Automotive Materiel Readiness Command, TARCOM.

Anniston Army Depot became involved in August 1961,

Rebuilt turret mounting 105-mm gun is mated to rebuilt chassis.

An ***M-48A5*** **refurbished engine compartment ready for powerpack installation.**



A Korean War era *M-48A1* enters disassembly building.

when the depot and Chrysler Corporation converted eight *M-48A1* tanks to use the engine, main gun and other equipment in the *M-60* series tanks then in production. This was the same basic idea used in the *M-48A5* program 14 years later.

Later in 1961, the Army decided that the converted *M-48A1* tanks would keep their 90-mm guns. This was the *M-48A3*. Beginning in February 1962, Anniston Army Depot produced about 800 *M-48A3*s for the Army and Marine Corps. Another 400 *M-48A3*s were turned out by Red River Army Depot near Texarkana, Texas.

Damaged *M-48A3*s returned from the Vietnam conflict were rebuilt at Anniston.

The 1973 October War in the Middle East focused the attention of military planners at the Department of Defense on the use of armor in land warfare. There was obviously a need to increase the number of Army tanks.

One primary concern was the relatively low rate of production of the *M-60A1* tanks. So naturally, the idea of a tank conversion program was reviewed as a way of supplementing the tank fleet.

During the 1960's and the 1970's, National Guard and Army Reserve armor units were still equipped with the gasoline-powered, 90-mm-gunned *M48A1* tank. A program was designed to convert 1,188 of these tanks, this time including upgunning them to 105-mm, to produce *M-48A5* tanks.

Competitive bids were taken for this conversion program in 1975. Anniston Army Depot, because of its experience in tank overhaul and conversion, was permitted to bid against two large manufacturers. The Depot's bid was significantly lower than the competitors', and it got the program.

The Depot had many years of experience in repairing and rebuilding tanks. Its equipment and methods of doing business, plus the talents and skills of its employees, fit the program very well.

The specifics of the tasks in the *M-48A5* program had to be mastered, but the basic skills required were already to be found in the Depot's work force.

The transmission work by itself is a complex remanufacturing job, and changing the transmission from gasoline to diesel compatability meant it had to be adapted to handle higher torque at lower rpms.

The single, biggest task of the conversion, however, was that of welding and machining on hull and turret armor.

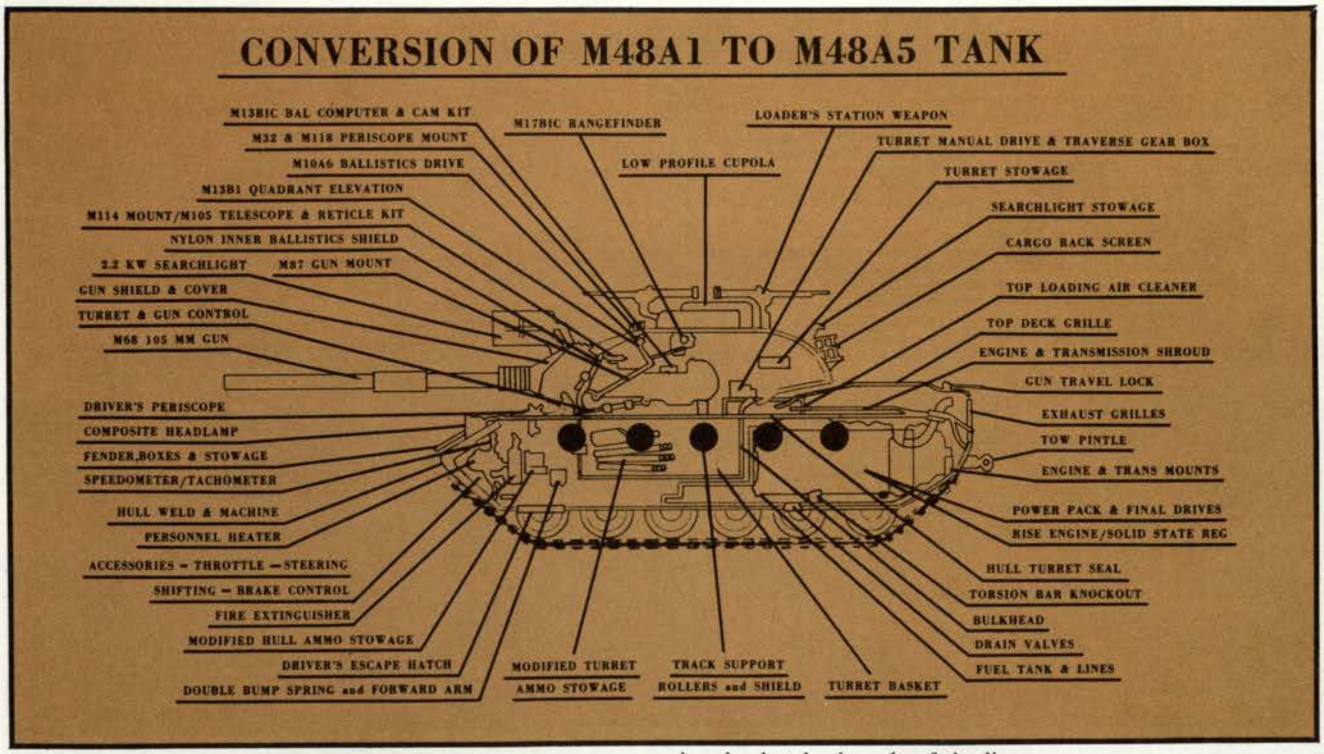
During the years after the Depot began the program, additions to the original number of 1,188 brought the total number of *M-48A5* tanks to 1,064. By November 1977, the Depot had produced its 1,000th tank. In the peak production period, during 1977 and 1978, the Depot produced an average of more than four tanks a day. During that same period, some 300 tanks were at various stages and stations in the production process at any given time.

Once a tank was completed, it was turned over to the Depot's Directorate for Quality where it was driven 25 miles on a test track and 60- and 40- percent inclines to check for all possible defects. The original test run was 45 miles per tank. However, near the end of the program the Depot began looking for means of saving energy. Since the inspectors had found that any defects showed up in the first 25 miles of the test run, it was cut back to that distance.

Although every main gun had been shipped to Aberdeen Proving Ground for testing before being installed on the tank, Depot testing also included taking randomly-selected tanks to the firing range where each went through firing tests to determine how well the gun functioned.

After the test run, the tanks went back to the final repair section for any necessary corrections. Then it was back to the test track for one final checkout run of 8 miles before the final coat of paint and preparation for shipping.

When the tanks left the Depot, they resembled as closely as possible the *M-60A1*. In fact, the performance data is virtually



the same as that of the *M60A1.*

The engine and transmission are the same as those in the *M-60A1,* as are the main gun, turret control system, and fire control. In fact, the firepower of an *M-48A5* is almost identical to that of an *M-60A1.* One 7.62-mm machinegun is mounted to fire coaxially with the main gun and an *M-60D* 7.62-mm machinegun is mounted at the loader's hatch. The tank commander can have either the *M-60D* or a .50 caliber *M-2* machinegun mounted on the cupola, for a total of three machineguns on the tank.

The *M-48A5* weighs 54 tons combat loaded, a weight which includes 10,000 rounds of machinegun ammunition and 54 rounds for the main gun.

The *M-48A5* can cross an 8-ft, 6-in. ditch; climb a 36-inch vertical obstacle; climb a 60-percent slope; negotiate a 40-percent side slope; and travel 310 miles on 385 gallons of fuel capacity at a 30 mph allowable speed.

Any story about an Anniston Army Depot product would be incomplete without a brief mention of the human element involved at both ends of the line.

Service to our country is an honored—and honorable—tradition in the South. At Anniston Army Depot, where the average employee's age is 43, many people have friends, relatives, sons or daughters serving in the Army, as well as in other service branches.

As the work force assembles a tank or a weapon, or plans an ammunition shipment, their thoughts go to the people who will be receiving that materiel. Because of those thoughts, each *M-48A5* tank in this conversion program was not just a machine which was to wind up someday with a nebulous Army unit which was only a name or a number to that employee. Each tank was built for "my son," or "my friend's son," or maybe even for "my daughter who works in tank maintenance."

Sentimental? Perhaps.

But at Anniston Army Depot, seeing that *our* troops are well equipped is not an empty phrase. It's a sentiment which is built into every product that leaves the Depot.

BOB BLACK is a 1971 graduate of Vanderbilt University, where he majored in English literature. He is a second-year intern in the Army's Information and Editorial Intern Program. He has done graduate work at University of North Carolina at Chapel Hill.

CATHY HARDMAN graduated from the University of Oklahoma in 1968 with a degree in English literature. She has worked in the field of journalism since 1972, when she became a civilian Army newspaper editor in Germany. In 1978, she joined the Public Affairs Office at Anniston Army Depot. She is a graduate of the Information Officer's Course, Defense Information School, Ft. Benjamin Harrison, Indiana.

Shaped Charges Versus Armor—Part II

by Joseph E. Backofen, Jr.

This is the fourth in a series of articles on tanks and the technologies of armor penetration, armor, and survivability.

The contest between armor and armor-defeating weapons is as old as fortifications and naval warships. When armor was applied to mechanized land battle systems (tanks), weapons designers were aware of the technologies/means of perforating the armor such as kinetic-energy, armor-piercing shot and high-explosive shell. However, the use of these on the battlefield to defeat tanks required prepositioning of crew-served, antitank weapons behind protection everywhere one anticipated a tank attack; or rapidly deploying lightweight, unarmored, towed antitank systems such as the various pre-World War II 37-mm antitank guns that could outrace the tanks to their objective(s). The situation was changed by the introduction of shaped-charge technology.

Early scientific literature contained some information about the shaped-charge (Munroe or Neumann) effect and a superficial understanding of how and why it worked.[1,2,3] Its application to antitank weapons did not wait for the establishment of a firm shaped-charge technology base. In 1930, Germany started a series of highly classified developments on an antitank rifle grenade and artillery shells, in addition to devices for the Engineers such as the 50-kg hemispherically-lined hollow charge that gained fame from its use during the airborne attack on Fort Eben Emael on 10 May 1940.[4,5]

In 1932, F. R. Thomanek suggested that a special antitank grenade launcher utilizing shaped-charge projectiles could be developed. On November 28, 1935, he presented a prototype to Hitler and his staff in the Reichskanzlei at Berlin.[4] Others, such as Dr. W. Trinks and Major Schwenninger, began work on gun-fired, shaped-charge projectiles from which came the 7.5-cm *Granate 38* and similar *Red Head* ammunition for artillery howitzers.[2,6]

In Switzerland, H. Mohaupt had similar ideas and began research in Zurich in the mid-30's with the objective of developing antitank grenades and shells.[2] His demonstrations of grenades to the British in 1938 and 1939 led to their development of the *No. 68* rifle grenade and the Projector Infantry Antitank (PIAT).[7] Similarly, his cooperation with the French led them to assist in his relocation to the U.S. where his grenade developed into the *M-9* rifle grenade and the *M-10* grenade warhead for the 2.36-inch *Bazooka.*[7,9]

The shaped charge quickly became the most significant threat to tanks because it alone could be made small enough to allow the individual infantryman a weapon to pierce and stop tanks. Fur-

thermore, as the effect was almost independent of the forward velocity of the warhead carrier, it was relatively unimportant how the warhead was delivered to the target. The latter characteristic made the tank perforating ability of guns/howitzers using hollow-charge ammunition independent of range. The lined, hollow cavity focused the explosive's energy so intensely within the metallic jet that it was capable of piercing the heaviest thickness of steel armor that could be applied to tanks.[1]

The initial antitank shaped-charge weaponization concepts included:

- Grenades that gave infantrymen the capability for their own defense against tanks;
- Artillery shells for short-barrelled howitzers which were not capable of firing high-velocity, kinetic-energy projectiles;
- Shells for use with recoilless weapons such as recoilless rifles and rockets

Table 1. Principal Tactical and Historical Characteristics Of Some Infantry Hand, Rifle, and Propelled Shaped-Charge Grenades

NAME	ARMOR PENETRATION (mm)	WEIGHT (1) (kg)	EFFECTIVE RANGE (m)	TYPE (2)	MOE (3) X10^3	YEAR FIELDED	COUNTRY OF ORIGIN
Schuss Gr. P-40	38	0.5		R		40	Germany
No. 68	50	0.9	50	R	2.8	40	U.K.
PGS	30		60	R		40	U.S.S.R.
M-9	40			R		41	U.S.
M-9A1	60	0.6		R		41	U.S.
Haft Hohladung	<110	3.0 (4)	—	H	—	42	Germany
Panzerwurfmine (L)	110	1.4	20	H	1.6		Germany
Klein Gew. Panzergr.	40	0.2	50	R	10.0	43	Germany
Gross Gew. Panzergr.	40	0.4	100	R	10.0	43	Germany
SS Gew. Panzergr. 46-mm	90	0.4	100	R	22.5	43	Germany
SS Gew. Panzergr. 61-mm	125	0.6	200	R	41.7	43	Germany
Panzerwurfkorper 42LP	80	0.6	60	(5)	8.0		Germany
RPG-43	75	1.2	20	H	1.3	43	U.S.S.R.
Panzerfaust 30	200	5.2	30	P	1.2	43	Germany
Panzerfaust 30K	140	3.4	30	P	1.2	43	Germany
Type 3 (Large or Small)	70	1.3/0.8	10	H	0.5	44	Japan
Type 2 (Lunge)	150	5.3	—	H	—	44	Japan
Panzerfaust 60	200	6.8	60	P	1.8	44	Germany
Panzerfaust 100	200	6.8	100	P	2.9	44	Germany
Panzerfaust 150	200	6.7	150	P	4.5	45	Germany
No. 85	60	0.6		R		45	U.K. (U.S.)
RPG-6	100	1.1	20	H	1.8	45	U.S.S.R.
PG-2	180	1.8	150	P	15.0	49	U.S.S.R.
P-27	250	3.8	150	P	9.9		Czech.
ENERGA	270	0.7	115	R	44.4	50	Belgium
M-28	200	0.6	100	R	33.3	50	U.S.
M-50	300	0.7	100	R	42.9	50	France
M-31	270	0.7	115	R	44.4		U.S.
PRC 40/80 TYPE 56	250	1.8	150	P	20.8	56	PRC
Handgranate zur Panzerabwehr	200 (6)	0.9	unk	H		unk	Hungary
RB57	270	2.4	400	P	45.0	57	Yugoslavia
DM22	260	0.7	80	R	29.7		W. Germany
RFL-73 Jet HP	300	0.8	200	R, P	75.0	unk	Belgium
44-mm Panzerfaust	320	2.1	200/500	P	30.5/76.2	59	W. Germany
PGN60	100	0.6	90	R	15.0	unk	Poland
M-60	>200	0.6	150	R	50.0	60	Yugoslavia
MK61	300	0.7	100	R	42.9	61	France
M-72	300	2.4	200	P	25.0	62	U.S.
PG-7 (RPG-7)	320	2.3	500	P	69.6	62	U.S.S.R.
RKG-3, 3M, (-3T)	120	1.1	20	H	2.2	64	U.S.S.R. (PRC)
ARP-RFL-40 (N or BT)	100	0.3	200	R	66.7		Belgium
50/100 B50	300	4.1	100	P	7.3	unk	N. Vietnam
Minimam	340	2.9	200	P	23.4	68	Sweden
AP32Z	100	0.5	150	R	30.0	unk	Belgium
AP32ZA	80	0.5	150	R	24.0	unk	Belgium
65AC28R2	300	0.7	120	R	51.4	67	Belgium
40-mm STRIM F1	100	0.5	100	R	20.0	unk	France
SARPAC	300	2.7	200	P	22.2		France
CETME, 70-mm	300	5.0	200	P	9.0	Dev.	Spain
Armbrust	300	4.8	300	P	18.8		W. Germany
Advanced Grenade (PHOTO)	unk	unk	unk	R		unk	Hungary
MAS Type A (ARPAC)	250	1.3	100	P	19.2	unk	France
63-mm Grafac	300	0.5	100	R	60.0		France
HEDP, M-433	50	0.2	200	G	50.0		U.S.
Viper	unk	<3.2	>500	P		Dev.	U.S.

(1) Includes launcher weight for one-shot throwaways
(2) H = Hand; R = Rifle; P = Propelled by rocket or recoilless; G = 40-mm Grenade launchers
(3) Measure of effectiveness = Armor Penetration × Effective Range ÷ Weight
(4) Typical of a series of charges 2 to 10 kg with magnetic or sticky paste attachment
(5) Pistol Fired
(6) At 60° obliquity
(7) PRC is Peoples Republic of China

developed for airborne troops who needed to have the best punch for the combat weight of the gun system/ammunition.

Once the military believed that the shaped charge could pierce armor and destroy tanks, prompt attention was paid to how to deliver it to targets. This is especially evident in descriptions of how quickly Colonel Skinner achieved recognition during his first firing demonstration of the 2.36-inch rocket and of how quickly the *Bazooka* went into production and was delivered to the troops.[7] However, it is also witnessed by the rapid escalation in armor penetration capability and effective range of the weapons developed during World War II as tank armor thicknesses were increased.

Table 1 illustrates the progression of armor penetration capability of the various types of grenade weapons as well as the weight of one unit (including the launcher weight when it is a throwaway type) and the typical effective range against stationary targets. The rifle grenades developed just before or during the initial stages of the war only possessed the capability of perforating thinly armored vehicles (such as the German *T-III* or *T-IV* and the British *Crusader*).

Greater penetration capability was achieved by larger hand-emplaced charges that either used magnets or sticky paste for attachment to the tank.[10] Since attachment to the tank by hand was not eagerly anticipated by troops, a hand-thrown grenade stabilized by a parachute or ribbon was developed by the Germans and Russians in order to increase the effective horizontal range.[7,10,12] It should be noted that these are also useful for lobbing out of building windows onto the tops of tanks located out in the street.

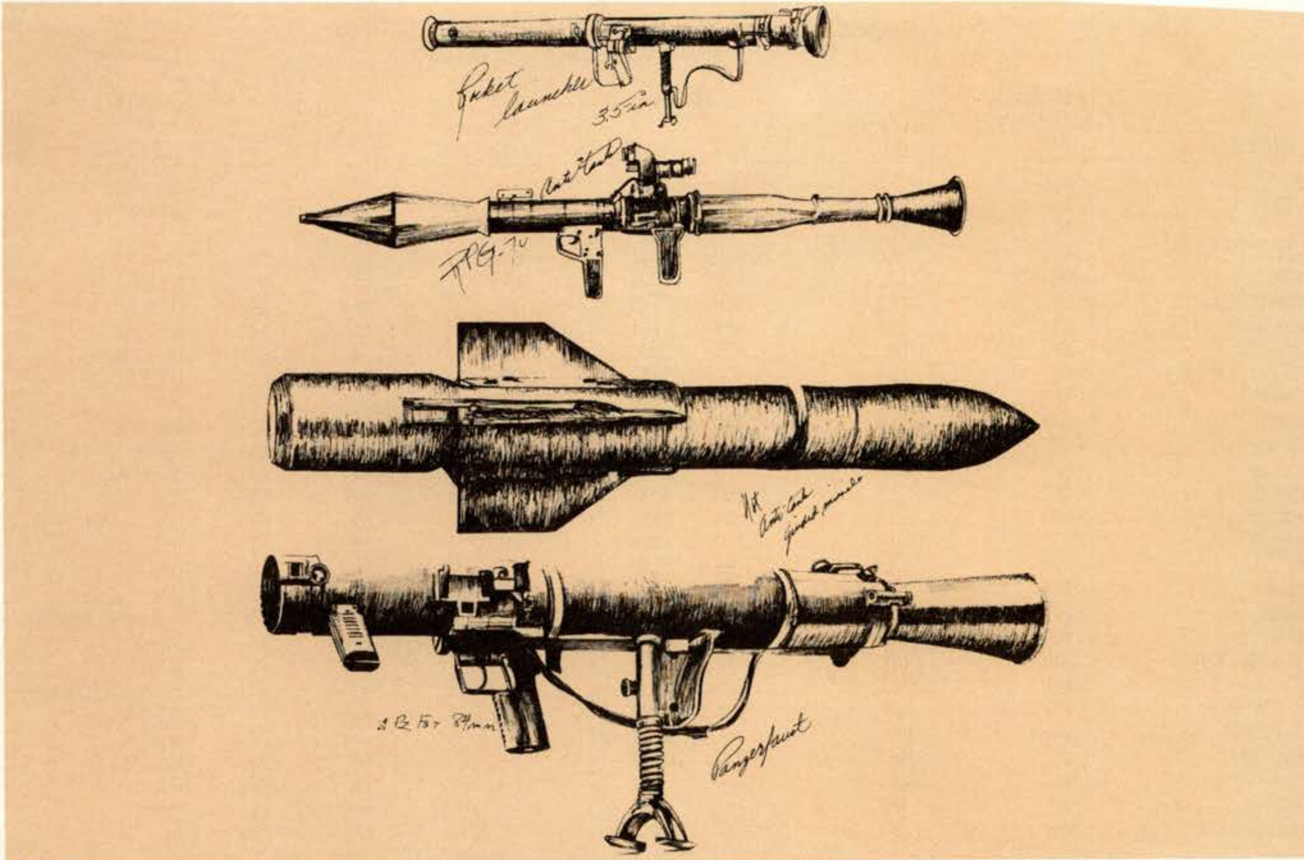
Further increases in range were achieved by both recoilless projection of the grenade from a tubular launcher and fin stabilization (*Panzerfaust*). More recently, the range of rifle grenades and recoilless projected grenades has been extended to the use of rocket-assist after launch (*RFL-73 Jet HP* and *RPG-7*, respectively).[13,14] The first rocket propelled grenades were used with crew-served weapons; but Table 1 also includes these grenades, such as the *M-72* LAW, that depend solely on a rocket for projection to the target when the weapon can be carried and operated by one person.

The information presented in Table 1 is of interest in several ways. For example, one can observe the stagnation in warhead penetration capability since about 1950, as well as the developmental rankings of the various countries over the past 40 years. However, one can also construct the following measure of effectiveness (MOE) in order to examine the combat-load efficiency with which the infantry has been provided with a

Table 2. Principal Tactical and Historical Characteristics Of Some Crew-Served Portable Weapons Using Unguided Shaped-Charge Projectiles

NAME	ARMOR PENETRATION (mm) (1)	WEIGHT ROUND	(kg) SYSTEM	RANGE EFFECTIVE (2)	RANGE MAX	MOE (3) X103	YEAR FIELDED	COUNTRY OF ORIGIN
7.5 cm L.G. 40	75	5.8	207.0				40	Germany
10.5 cm L.G. 40	100	14.8*	431.0		1500		41	Germany
3.7 cm PAK Stiel Gr. 41	180	8.5	432.0	250	800	5.3/0.1	41	Germany
PIAT	80	1.4	14.5	105	686	6.0/10.6	41	U.K.
Smith Gun (3.0-inch)	65	2.7	274.4		457	/0.1	41	U.K.
BAZOOKA (2.36 inch)	80	1.5	6.0	100	366	5.3/1.3	42	U.S.
Panzerschreck	180	3.3	9.2	150	400	8.2/2.9	43	Germany
Puppchen	180	2.6	142.9	400	700	27.7/0.5	44	Germany
PW K 8H63	140	2.7	600.0	600	750	31.1/0.1	45	Germany
M18, 57-mm	75	2.5	20.2	450	3932	13.5/1.7	45	U.S.
M20, 75-mm	100	9.6	75.1	1000	2100	10.4/1.3	45	U.S.
SPG 82	230	4.6	37.8	275	700	13.8/1.7	unk	U.S.S.R.
Carl Gustav	380	3.2	14.5	320	1000	38.0/8.4	49	Sweden
73-mm STRIM	250	1.5	6.6	200	unk	33.3/6.2	50	France
3.5 inch Bazooka	280	4.0	5.9	275	1200	19.3/7.7	50	U.S.
B10, 82-mm	300	7.3	85.5	400	4700	16.4/1.4	50	U.S.S.R.
Blindicide	300	1.6	8.4	200	900	37.5/7.1	51	Belgium
M27, 105-mm	180	13.2	150.0	1250	8000		51	U.S.
Tarasnice (T-21) 82-mm	230	3.6	20.0	650	2800	41.5/7.5	52	Czech.
M40, 106-mm	450	7.7	130.0	1000	6876	58.4/3.5	53	U.S.
Type 56, 75-mm	80	9.0	86.0	500	6600	4.4/0.5	56	P.R.C.
B-11, 107-mm	380	16.8	240.0	450	6650	10.2/0.7	unk	U.S.S.R.
Carl Gustav M2	400	3.2	14.2	400	2300	50.0/11.3	57	Sweden
M58, 95-mm	300	10.1	140.0	700	6000	20.8/1.5	58	Finland
M67, 90-mm	380	4.2	15.8	400	2100	36.2/9.6	59	U.S.
M59, M59A, 82-mm	250	6.0	386.0	785	7560	31.5/0.5	59	Czech.
M60, 82-mm	220	7.2	122.0	1000	4500	30.6/1.8	60	Yugoslavia
WOMBAT	400	12.8	275.0	1000	4000	31.3/1.5	62	U.K.
PV1110, 90-mm	380	9.6	260.0	900	3000	35.6/1.3	62	Sweden
M65, 105-mm	330	unk	280.0	600	6000	—/0.7	65	Yugoslavia
SPG-9	330	3.5	47.6	1000	1300	94.3/6.9	68	U.S.S.R.
STRIM, 89-mm FI	400	2.2	7.3	500	2300	90.9/27.4	69	France
Carl Gustav ME-500	400	3.2	17.6	700	2300	87.5/15.9	70	Sweden
ACL/APX80	400	3.6	13.1	550	2000	61.1/16.8	75	France
Folgore	400	5.2	17.0	500	1000	38.5/11.8	79	Italy

(1) At 0° obliquity
(2) Stationary tank type targets, references contains some information for moving targets
(3) Measures of Effectiveness = Armor Penetration × Effective Range ÷ (Projectile weight/System weight, respectively)
(4) P.R.C. is Peoples Republic of China
* Projectile weight



self-defense means of perforating tank armor:

MOE = armor penetration × effective range ÷ consumed weight

These factors measure weapons variables such as, *relative incapacitating effect, effective range,* and *ammunition supply effect,* which can be used to quantify a weapon's potential effect on the battlefield.[15] The MOEs presented in Table 1, however, have been constructed more to illustrate both the relative worth of the various forms of antitank grenade weapons and their development/improvement over the past 40 years.

From the tabulated information, one can see that hand-thrown grenades are relatively ineffective in comparison to rifle or propelled grenades. Thus, they would not be favored for use by infantry, except possibly under certain circumstances, such as operations in urban warfare. In this particular case, they could be used like large bomblets/improved conventional munitions to attack the lightly-armored tops of tanks.[1]

Table 1 shows that rifle grenades have improved from being 10 times better than hand-thrown grenades to 30 times better. This effectiveness has been achieved by the development of lightweight grenades that possess a very significant armor penetration capability (300 mm or 11.82 inches). The implication is that these enable an infantryman to engage and defeat armored vehicles at the cost of carrying only a pound or two of additional weight. The grenades may not be suitable for use in open fields or deserts; but they could be very handy for operations in built-up areas. Furthermore, even if they were not capable of destroying tanks fabricated with advanced armors, they would still be significantly effective against mechanized infantry combat vehicles and other lightly armored weapon systems.

The measure of effectiveness brings to light that propelled grenades that use throwaway launchers have always been less combat-load effective than rifle grenades. This was a problem with supplying the original *Panzerfausts* that was going to be corrected with the introduction of the *Panzerfaust 250,* which used a reusable launcher.[10,12] Propelled grenades that use reusable launchers, such as those used with the *RPG-7* and the *44-mm Panzerfaust,* are specifically superior in effectiveness to rifle grenades when the extra weight of the projectile is used in order to achieve increased range by means of rocket propulsion after launch. This latter technique has been well known for ages, however, and is also adaptable to rifle grenades, crew-served recoilless projectiles, rockets, and gun projectiles.[16]

In the case of a new grenade-type weapon with a low MOE, such as *Armbrust,* one must note that a specific tactical advantage (the surprise and protection afforded by firing from enclosed areas to ranges not achievable with present rifle grenades) is being purchased at the cost of weight.

When one views the armor penetration achievable with grenade weapons, one notes that very little has changed in the past 20 to 30 years. Undoubtedly, therefore, this will be one area in which there must be significant technology development efforts in response to advanced armors, unless the infantry is going to be strapped to crewing relatively-heavy, dedicated antitank weapons or left to the mercy of tanks.

Table 2 contains information and measures of effectiveness for crew-served antitank weapons based upon the use of shaped charges. It should be noted that these weapons generally have about a third more armor-penetration capability and a longer effective range than grenade weapons. However, the MOE for the usage of ammunition is comparable to rifle grenades and poorer than that of grenades propelled from reusable launchers until one begins to compare modern rocket-assisted weapons, such as the Soviet *SPG-9* or

Table 3. Principal Tactical and Historical Characteristics Of Some Antitank Guided Missiles (ATGM)

NAME	ARMOR PENETRATION (mm)	WEIGHT (kg)	RANGE (m) MIN.	RANGE (m) MAX.	(1) MOE X10³	YEAR DESIGN	YEAR FIELD	COUNTRY OF ORIGIN
X-7	unk	9.0	unk	1200	—	41	45	Germany
SS-10	420	14.8	300	1600	45.4	48	54	France
Dart	460	44.9	450	3048	31.2	51	—	U.S.
SS-11	600	29.9	500	3000	60.2	53	56	France
ENTAC	650	12.2	400	2000	106.6	unk	57	France
Shmel (Snapper)	>350	22.3	550	2330	36.6	unk	59	U.S.S.R.
Malkara	(2)*	93.4	unk	2134	—	51	59	Australia
Cobra 810	475	10.3	400	2000	92.2	54	60	W. Germany
Falanga (Swatter)	>400	26.8	550	2500	37.3	unk	62	U.S.S.R.
Vigilant	580	14.0	180	1600	66.3	56	62	U.K.
Bantam	500	11.5	250	2000	87.0	56	63	Sweden
KAM-3D	500	15.7	350	1800	57.3	56	64	Japan
Mosquito	660	14.1	350	2400	112.3	54	64	Swiss/Italy
Malyutka (Sagger)	480	11.3	500	3100	131.7	unk	65	U.S.S.R.
Shillelagh	>600	26.8	60	3000	67.2	59	67	U.S.
Swingfire	>530	10.0	140	4000	79.4	58	69	U.K.
TOW	500	20.9	65	3750	89.7	65	70	U.S.
Dragon	500	11.0	50	1000	45.5	64	73	U.S.
MILAN	>520	11.8	25	2000	88.1	63	74	Françe/W. Germany
KAM-9	500	unk	unk	4000	—	66	74	Japan
FAGOT (SPIGOT)	unk	unk	unk	2000	—	unk	75	U.S.S.R.
HOT	800	21.8	75	4000	146.8	64	77	France/W. Germany
AT-5 (Spandrel)	unk	unk	unk	4000	—	unk	77	U.S.S.R.
AT-6 (Spiral)	unk	unk	unk	7000	—	unk	77	U.S.S.R.
Copperhead	unk	63.5	3000	20000	—	70	Dev.	U.S.
Hellfire	unk	43.0	unk	unk	—	71	Dev.	U.S.
Picket	unk	6.0	—	500	—	unk	Dev.	Israel
Sparviero	unk	19.0	75	3000	—	68	Dev.	Italy

(1) Measure of Effectiveness = Armor Penetration × Maximum Effective Range ÷ Weight of missile (which includes the weight of throwaway launch tubes)

*(2) The Malkara is equipped with a high-explosive, squash head warhead. Penetration is caused by the shock wave passing through homogenous material and causing spalling of the rear surface.

Swedish *Carl Gustav* with *M2-550* ammunition, and the French *STRIM 89-mm F1* with the Soviet *RPG-7.* This latter weapon has had MOEs of 69.6 and 23.5 for the ammunition and system, respectively, for 18 years.

Basically, what the MOEs and data are implying is that one soldier carrying an *RPG-7* and ammunition is better than two soldiers carrying an *M-67,* 90-mm recoilless rifle and the same number of rounds. Another way of visualizing this is that someone carrying an *RPG-7* and four rounds has more firepower effectiveness than someone carrying either six *M-72* LAWs or possibly, five *Vipers*; both of which have about the same combat weight. When one further considers that the person with the *RPG-7* as his personal weapon has probably received significantly more training, tankers need be concerned with the threat posed by a lone enemy soldier. Lessons learned in Vietnam and the 1973 Arab-Israeli War have confirmed these reasons for concern.[17,18]

The MOE can be used to express the desirable characteristics for a new munition such as *Viper*. If *Viper* were to weigh 3.1 kg with its throwaway launcher, and if one would hope for an MOE of about 70 in order to be in the ballpark of the 2.3 kg *PG-7* grenade, then the armor penetration x effective range product would have to be 217.0 X 10³. This would mean that one would require armor penetration and effective ranges of something like 310 mm/700 m, 335 mm/650 m, 365 mm/600 m, 395 mm/550 m, or 435 mm/500 m. If these are not achievable with modern technology, then one should seriously consider the standardization, cost savings, logistic impact, and multitarget usefulness of such existing systems as the *RPG-7, STRIM 89-mm F1,* or *Carl Gustav* systems.[17,19]

Table 3 presents historical information and similar MOE for antitank guided missiles (ATGM), beginning with the *X-7* of World War II. During 1941, it had become obvious to researchers at Bayrische Motoren-Werke (BMW) that tank hits could be achieved at relatively long ranges, using the combination of wire-guidance and rocket propulsion.[20] However, the German Army Weapons Office waited until early 1944 before placing development orders with Ruhrstahl and two other firms.[21] Even so, the *X-7* was apparently field tested on the Eastern Front during early 1945.[12,21,22]

Basically, an ATGM uses a large shaped-charge warhead that is flown under guidance to the target.[23,24] The increases in MOE have principally been achieved by increasing the effective range by means of better guidance technology. In this respecct, ATGMs have been generally designated as belonging to a specific generation such as: first generation, manual guidance; second generation, automatic guidance based upon the operator keeping the sight on the target with the fire control watching a flare on the rear of the missile; and third generation, beam rider guidance which is dependent on the target being illuminated by a device such as a laser. Shaped-charge warhead performance, on the other hand, has remained essentially constant or even decreased since the introduction of ENTAC in 1957.

From the ATGM weights in Table 3, one can easily see that they are now crew-served weapons that have reached a maturity comparable to antitank guns during World War II. In other words,

ATGMs must either be prepositioned at potential armor objectives and protected from harassment by fire or must be placed on vehicles, helicopters, or fixed wing aircraft that can outrun the tanks to the vicinity of their objectives.

The alternative of placing ATGMs on armored vehicles that have comparable mobility to the tank, such as the improved tow vehicle, is a specialized application that requires the use of terrain features to protect the system while it is engaging enemy armor.[25] Even then, this specialized vehicle/ATGM system should really be faster moving than the tank that it is intended to intercept and defeat.[26] Another alternative is to put an ATGM on every lightly armored vehicle that will be located on the objective of counterattacking tank units because the vehicle had acccompanied the original assault. This has been done by the Soviets with their *BMP/Sagger.*[27]

It should be noted that the MOE for ATGMs presented in Table 3 are only achieved when the ATGMs are used at maximum range. Many of the ATGMs also have a minimum range. This was mostly a problem with the first generation missiles; but it can still be uncomfortable when one has to face a tank at close range. With TOW's range of 3,750 meters and typical ground engagement ranges of less than 2,000 meters, its MOE will not always be achievable unless possibly when mounted on a helicopter. Another example is that it would be less than desirable for infantry to carry the weight of a *Dragon* or *Milan* around a battlefield where typical engagement ranges would be 800 meters or less.

Furthermore, in light of the advanced armors being used over the frontal arcs of tanks in order to defeat ATGMs,[28] these missiles may now only be useful in ambush positions from which less exotic weapons, such as propelled grenades, may be just as effective. In other words, the low MOEs associated with close engagement mean that one is carrying around too much weight in order to engage and destroy a tank. It might be more appropriate to use a *Carl Gustav* system for which a laser-designated round similar to the experimental *ATLAS*[13] projectile could be selectively provided for use at long range.

It appears that the overlapping coverage provided when an army uses grenades, recoilless weapons, and ATGMs has numerous reasons for existence.[29] (It should be noted that the Soviet *BMP* and its associated personnel are equipped with all these shaped-charge weapons.)[27] It also appears obvious that, *as good as a TOW or Dragon may be, it is very wasteful to have to use them against targets such as a BMP, bunker, truck, or personnel which could be more appropriately/effectively engaged by rifle grenades, RPG-7s, or Carl Gustav-type systems.*

This fourth article in this series on tanks and the technology of armor penetration, armor, and survivability will be continued in the November-December 1980 issue of ARMOR.

Footnotes

[1]J. E. Backofen, Jr., "Shaped Charges — Antitank Effectiveness and Weaponization (Part I)," *Armor,* July-August 1980, pp. 60-64.

[2]J. E. Backofen, Jr., "The Weaponization of Shaped-Charge Technology," *Proceedings of the Fourth International Symposium on Ballistics,* October 17-19, 1978, American Defense Preparedness Association, Washington, D.C.

[3]G. Brikhoff, D. P. MacDougall, E. M. Pugh, and G. Taylor, "Explosives with Lined Cavities," *Journal of Applied Physics,* Volume 19, June 1948, pp. 563-582.

[4]F. R. Thomanek, "Die Erste Hohlladungswaffe," *Explosivstoffe,* No. 1, 1959, pp. 9-11.

[5]"Eben-Emael," *After The Battle,* No. 5, 1974, pp. 28-39.

[6]F. R. Thomanek, "Die Entwicklung der ausgekleideten Hohlladung," *Explosivestoffe,* No. 8, 1960, pp. 177-179.

[7]J. Weeks, *Men Against Tanks, A History of Anti-Tank Warfare,* Mason/Charter Publishers, Inc., New York, 1975.

[8]D. R. Beeman, "Shaped Charge/Armor Nenesis," *National Defense,* Vol. LXII, No. 348, May-June 1978, pp. 561-564.

[9]"U.S. Rocket Ordnance: Development and Use in World War II," Joint Board on Scientific Information Policy, U.S. Government Printing Office, 1946.

[10]I. V. Hogg, *The Encyclopedia of Infantry Weapons of World War II,* Thomas Y. Crowell, Company, Inc., New York, 1977.

[11]E. J. Hoffschmidt and W. H. Tantum, IV, *German Tank and Antitank in World War II,* WE, Inc., Old Greenwich, Connecticut, 1968.

[12]T. Gander and P. Chamberlain, *An Encyclopedia Survey of All Small Arms, Artillery, and Special Weapons of the German Land Forces 1939-1945,* Doubleday and Company, Inc., Garden City, New York, 1979.

[13]J. I. H. Owen, Editor, *Brassey's Infantry Weapons of the World 1950-1975,* Bonanza Books, New York, 1978.

[14]V. Nadin, "Shoulder-Fired Antitank Weapons," *Voyennyye Znaniya,* No. 11, 1979, pp. 30-31.

[15]T. N. Dupuy, Col. retired, *Numbers, Predictions and War Using History to Evaluate Combat Factors and Predict the Outcome of Battles,* The Bobbs-Merrill Company, Inc., Indianapolis/New York, 1979.

[16]N. A. Rynin, "Interplanetary Flight and Communication, Volume II, No. 6, Superaviation and Superartillery," Leningrad 1929, translated from Russian by Israel Program for Scientific Translations, Jerusalem, 1979, (available from U.S. Department of Commerce, National Technical Information Service, NTIS).

[17]K. Macksey, "Tank Versus Missile," *War Monthly,* Issue 5, 1974, pp. 38-48.

[18]T. B. Winfield, "The Future of Mechanized Warfare; Part II: The Lessons of Yom Kippur," *Canadian Defense Quarterly,* Vol. 7, No. 3, Winter 1977/78, pp. 26-32.

[19]M. R. Janay, "Carl Gustaf — A Weapon That Works!", *Military Review,* Volume LIX, No. 1, January 1979, pp. 59-63.

[20]H. von Zborowski, "BMW-Developments," in "History of German Guided Missile Development," AGARD First Guided Missiles Seminar, Munich, Germany, 1956, Published by Verlag E. Appelhans & Co., Brunswick, Germany, 1947, pp. 306-307.

[21]B. Gunston, "The Illustrated Encyclopedia of the World's Rockets & Missiles," Crescent Books, New York, 1979.

[22]F. J. Gerloff, "Antitank Defense: Part I: Interaction Between Applied Tactics and Weapons Technology," *Soldat und Technik,* No. 6, 1966, pp. 293-300.

[23]B. I. Yevdokimov, "Antitank Rocket Missiles (Protivotankovoye Reaktivnoye Orushiye)," Voyennoye Izdatel stvo Ministerstva Oborony SSSR, Moskva, 1964. (Translation released to public as AD655039, Clearinghouse, Department of Commerce, 1967)

[24]V. S. Knyas' kov and V. V. Rozhkov, "Military Rockets (Boyevyye Raketu)," DOSAAF, Moskva, 1977.

[25]N. Hannig, "Can Western Europe Be Defended by Conventional Means?," *International Defense Review,* Vol. 12, No. 1, 1979, pp. 27-34

[26]F. J. Gerloff, "Antitank Defense; Part II: Antitank Defense Today," *Soldat und Technik,* No. 8, 1966, pp. 348-355.

[27]J. K. McCaslin, Jr., "Combat Infantry Vehicles (BMP) in Combat," Student Research Report, U.S. Army Institute For Advanced Russian and East European Studies, Garmisch, Germany, 1976 (ADA067261 approved for public release, NTIS).

[28]R. Ogorkiewicz, "Tanks and Anti-Tank Weapons", in "New Conventional Weapons and East-West Security, Part I," *Adelphi Paper No. 144,* International Institute for Strategic Studies, London, Spring 1978, pp. 38-44.

[29]A. Ziegler, "Panzerabwehr heute und morgen," *Wehrtechnik,* No. 2, February 1976, pp. 22-29.

JOSEPH E. BACKOFEN, JR. was commissioned in the Corps of Engineers upon graduation from the Polytechnic Institute of Brooklyn in 1966. While with the 62d Engineer Battalion, his service included Rome Plow Land Clearing Operations in Cambodia and Vietnam. Mr. Backofen is currently involved with the development of advanced weapons technology at Battelle Columbus Laboratories.

The French Armored Division

by Colonel Arnaud P. Loubens and Captain Marcel M. Valentin

Most soldiers assigned to U.S. Army Europe (USAREUR) and 7th Army have some knowledge of their French comrades. They meet them during Allied conferences, field exercises, and social functions in various parts of Germany. Additionally, a well-accepted "Partnership Program" has established good relations between numerous French and U.S. Army units.

USAREUR personnel also know that the French soldiers they meet represent France's commitment to NATO involvement and that they are but a part of French Army and Air Force totaling 600,000 men and women, 1,400 tanks, and 1,000 aircraft.

Less well-known to American personnel is the fact that a draft is used to maintain the strength of the French Armed Forces and that the French Army is undergoing a 5-year reorganization and restructuring of its combat elements.

During the first 3 years of the program, many changes have been made in tables of organization and equipment (TOE), garrisoning and deployment of units, in the chains of command, and the doctrine published in field manuals. Other changes are still underway, including new weapons systems and equipment.

Training is being transformed by new audio-visual and simulation devices and new methods of instruction—all of which are consolidated in a Mission-Oriented Training System (MOTS).

The entire army is being revitalized and restructured, and its morale and *esprit* bolstered.

This article deals with the major elements of the reorganization and describes the new French armored divisions in some detail. In a later article, the new French infantry division and the army corps will be discussed.

The 1977-82 reorganization effort is directed toward achieving a better

balance of forces within budgetary limitations and it emphasizes combat effectiveness. The restructing is based on four organizational objectives—*standardization, simplification of command, implementation of a new mobilization plan, and a reduction in equipment costs and manpower requirements.*

Standardization of Units

Units are standardized according to their missions. This eliminates the old system of designating certain elements as maneuver forces and others as territorial forces. Now all units are placed in a system of conventional forces and units with like missions are equipped the same. Heretofore, territorial units were scattered hither and yon (Figure 1). Now the "territorials" are integrated into regiments (battalions or cavalry squadrons) and controlled by one of 8 armored or 7 infantry divisions. Improvements in these elements have been made by adding companies, vehicles, antitank missiles, and other items as needed for their assigned mission.

As with all attempts at standardization, some exceptions must be made. Such is the case here. The 9th Marine Division, 11th Airborne Division, and the 27th Alpine Division have been retained as specialized units for specific missions and operations in mountainous terrain, amphibious landings, and arctic climates. These divisions are also available for possible reinforcement of the 1st French Army in the "Central Battle."

Restructuring of the divisions is based on the quaternary, or "square," organizational concept which provides greater combat efficiency and flexibility by establishing a permanent combined arms system.

Simplification of command is achieved by merging the chains of command of operational and territorial forces where possible. For example, the commanding general of the VI Military Region is also the commander of the 1st Army Corps and has authority over all military units stationed in the territory. The region commander has two general officer assistants; one of whom performs duty with the 1st Army Corps and the other with the territorial forces. Another example of merged commands is found in Limoges where the commanding general of the 15th Infantry Division (ID) also commands the 43d Territorial Command. In wartime, he will retain command of the 15th ID while one of his two general officer assistants takes command of the 43d Territorial Command and the other assumes command of the 115th Infantry Division—a reserve unit.

Other organizational changes that affect the command and control of the new French Army include the elimination of brigade headquarters and the consolidation of most combat support and service support tasks at higher levels of command. Nuclear artillery, field artillery—other than that which is organic to division—air defense artillery, Army aviation, and intelligence units are consolidated at corps level. Service support is provided by division headquarters elements, the divisional service support battalions, and the corps logistical brigade.

Implementation of the new mobilization plan is based on the "derivation" principle, with 14 divisions being fielded on mobilization. Ten of these units will be formed from active army divisions and four will be created from service school personnel. This is done by retaining 85 percent of the career personnel in five active divisions and filling them to full strength with reservists who train with the division's subordinate elements in peacetime. Five more divisions are formed with 15 percent career personnel from the five active divisions and 85 percent reservists who have trained with the divisions during peacetime.

Unit integrity during and after mobilization is achieved by having each active army division's subordinate elements organize, train, and mobilize a companion reserve unit in peacetime. The reserve unit is made up of individuals who have completed their military commitment while serving with the active unit. Their assignment to a specific reserve unit is based on their qualifications and the proximity of their home to the unit. Practice mobilizations are conducted annually for each level of organization and the mobilization of the 115th ID in 1978 and the 104th and 109th IDs in 1979 proved the soundness of the system.

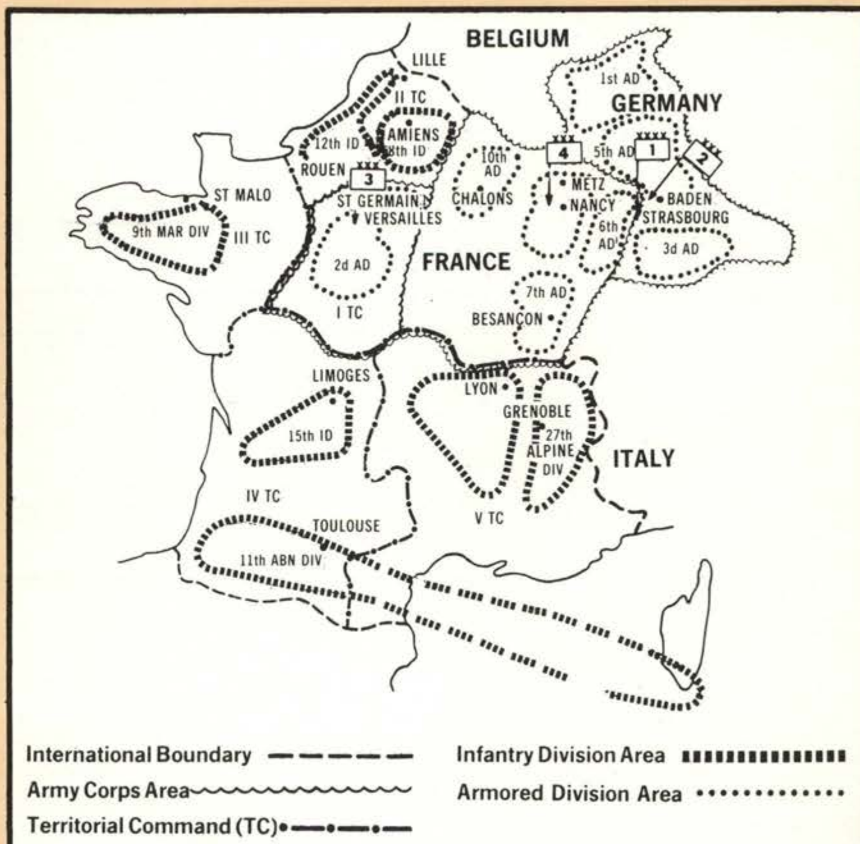


Figure 1

Cost Reductions

Costs have been reduced by cutting the total number of spaces and by making organizational adjustments. For example, one headquarters and services company now serves four line companies with about the same personnel as was required to support only three line companies in the past. Priority for manning the force is given to the troopers rather than the staffers. The chart below summarizes some of the benefits of the program.

	1977	*1979*
Army	*330,700*	*314,000*
Battalions	*230*	*205*
Fighting Units	*720*	*750*
Personnel	*89%*	*97.5%*

The Armored Division

The new French armored division presently is the lowest level at which fighting units and support units are combined and employed to carry out the maneuver concept of the corps commander. It is the major asset of the ground forces and a perfect example of the combined arms team where tanks and mechanized infantry are integrated organically at all organizational levels above the platoon. (Figure 2)

The divisions are made up of the following battalions: two tank, two mechanized infantry, one field artillery, one engineer, and one headquarters support.

Communication, transportation, medical, and ordnance support is grouped in the headquarters and support battalion and air defense is provided by the 20-mm automatic cannon and smaller caliber machineguns mounted on the division's tanks and infantry fighting vehicles.

An organic scout troop carries out reconnaissance and security missions for the division. The division also has an antitank company equipped with the *Vehicle de L'Avant* (VAB), or forward area combat vehicle, armed with the HOT missile which can engage enemy armor at ranges out to 4,000 meters.

The division strength is 7,000 men and it is equipped with 148 *AMX-30* (AMX-30B2) tanks, 132 *AMX-10s*, 115 *VABs*, 1,850 wheeled vehicles, twenty-four 155-mm self-propelled howitzers, 38 *Milan* antitank missiles, eighteen 20-mm antiaircraft cannon, twelve 120-mm mortars, and 12 *VAB*-mounted HOT missiles.

The main elements of the division are the tank and mechanized battalions.

The mechanized battalion (Figure 3) is a true armored unit, even though all its officers, noncommissioned officers, and enlisted men are infantrymen. They are mounted in the same types of vehicles as those found in the tank units—the *AMX-30* or *AMX-30B2* tank and the *AMX-10P* infantry fighting vehicle. The *AMX-30* tank fires a 105-mm armor-piercing, fin-stabilized, discarding-sabot round with a muzzle velocity of 1,550 meters per second and a shaped-charge round. Hit probability is excellent out to 3,000 meters. The battalion commander also controls the additional heavy firepower of an organic mortar platoon which is equipped with six 120-mm mortars that can engage targets up to a range of 13 kilometers. The battalion strength is 980 men and it is equipped with 200 vehicles, including 28 *AMX-30s* and 44 *AMX-10s*.

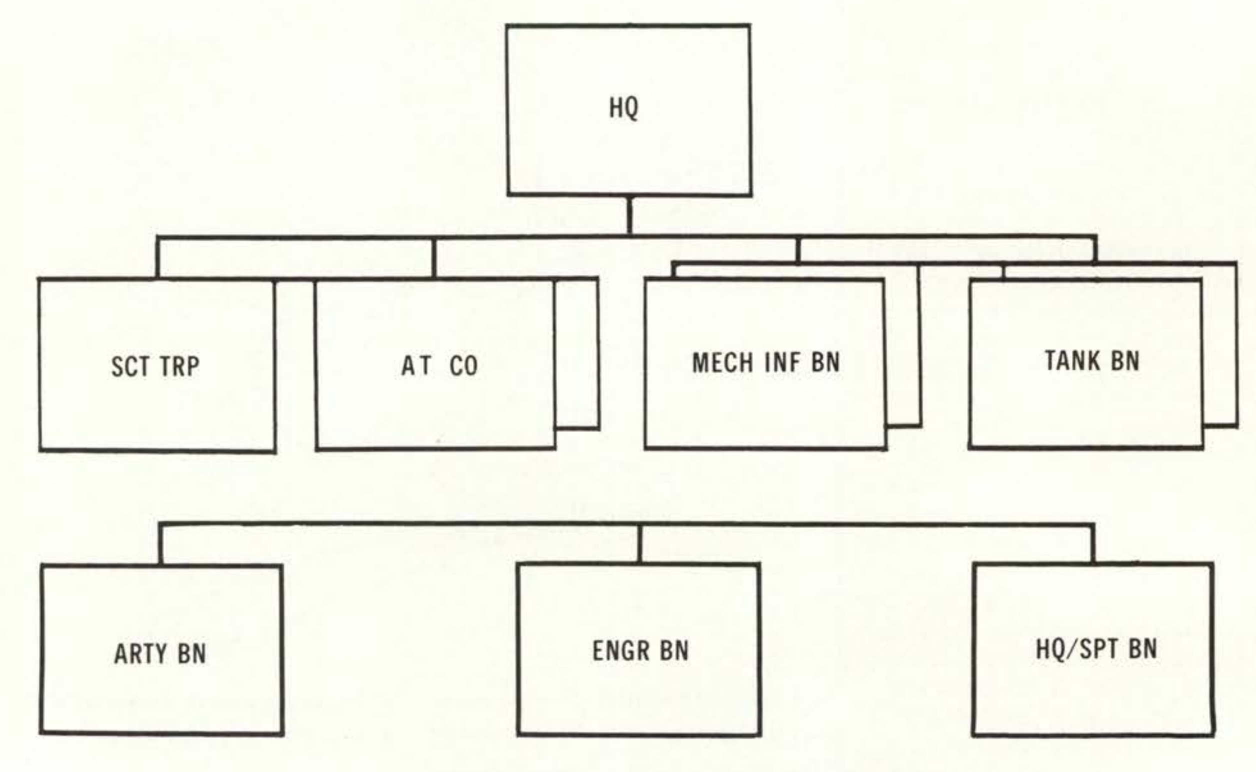
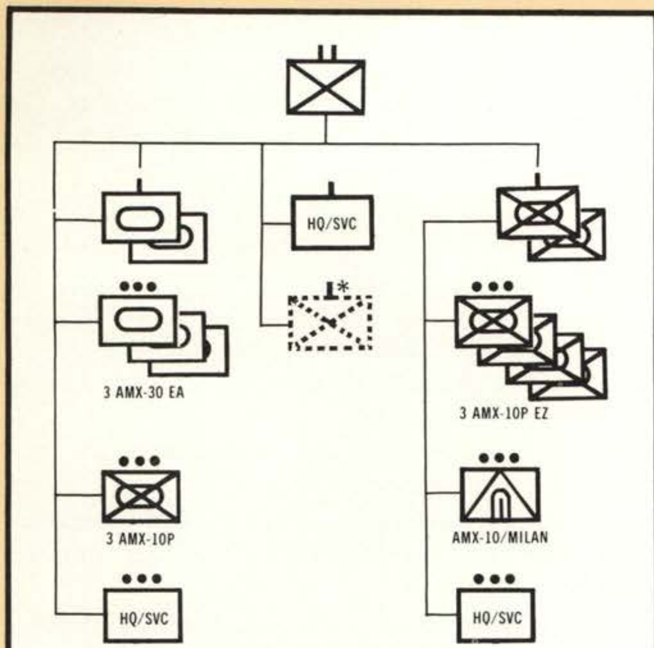


Figure 2



*A basic training company is organic during peacetime for the purpose of training draftees in nonspeciality MOSs.

Figure 3

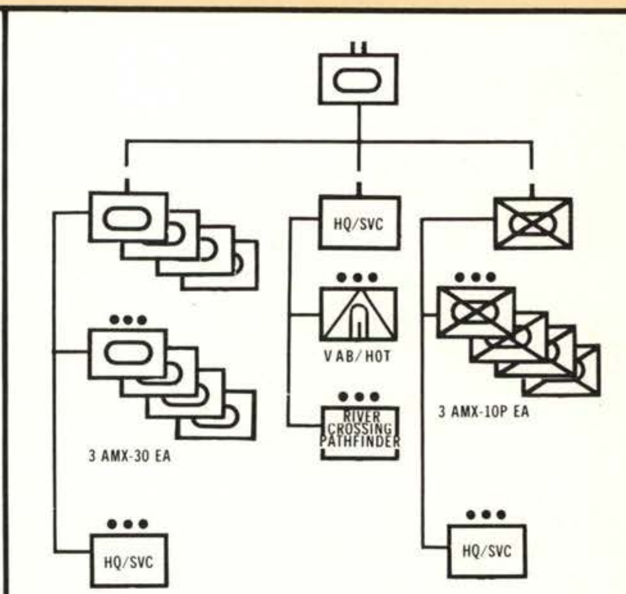


Figure 4

The tank battalion (Figure 4) is more arms-specific, in that it is tank-heavy, but it is still a true combined arms unit with four organic tank companies and one mechanized company from which mechanized platoons can be attached to the tank companies if necessary. All of the armored vehicles are waterproofed and equipped with chemical, biological, and radiological protection. All armored vehicles are capable of crossing contaminated areas and fording water barriers to a depth of 4.4 meters (14.5 feet)—capabilities that are essential on the modern battlefield. The battalion strength is 820 men and it is equipped with 220 vehicles, including 54 *AMX-30s*, and 19 *AMX-10s*.

The tactical advantages of the combined arms team are well-known in all armies. In the French Army, however, combined arms teams are not tailored at the last minute before an operation but are permanently organized with appropriate organic equipment. Other benefits of the French system include efficiency in training and better supply and maintenance. Regardless of whether training is conducted in garrison or in the field, the troops quickly acquire the habit of working together and thinking and operating as combined arms. Maintenance and supply are enhanced because mechanics and logisticians, whether they be infantry or armor, are accustomed to supporting tanks as well as infantry fighting vehicles—wheeled or tracked.

In summary, the French concept of modern armor, mechanized infantry, and supporting arms organized and trained in peacetime as combined arms units, gives field commanders the assets in leadership, tactics, firepower, and logistical support that will enable them to win the battles of the next war.

COLONEL ARNAUD P. LOUBENS was commissioned in Armor upon graduation from Saint-Cyr Military Academy in 1950. He has served in Vietnam, Algeria, Ethiopia, and Germany. He is a 1960 graduate of the Paris Staff College and commanded the 2d Cuirassiers, an armored battalion equipped with *AMX-30* tanks. He is presently serving as the French liaison officer to the U.S. Army Armor Center and Fort Knox.

CAPTAIN MARCEL M. VALENTIN was graduated from Saint Cyr Military Academy in 1967. He has served in cavalry units, the French Foreign Legion, Djibouti, Ethiopia and has commanded a tank company in the 18th Dragoons. A 1975 graduate of the French Armor Officer Advanced Course (AOAC) and a 1978 graduate of the U.S. Army AOAC, Fort Knox, he is currently an Armor Officer Basic Course instructor in the French Armor School, Saumur.

Pages from the Past

Constant Combined Arms

In the infantry and armor battalion, there should be a reorganization for training so that the unit could be more tailored to our team and task force principles and concepts. This would allow battalion and company commanders, staffs, platoon leaders, and down to and including the individual soldier to be in a constant combined arms state of training in garrison and during field exercises.

In addition, such reorganization would enable the commander, staff, and troops better to acquaint themselves with the capabilities and limitations of their attached units, to exchange and improve on old ideas, and to develop and institute new ones.

ARMOR
November-December 1963

Tactical Field Training

The difficult training to plan and accomplish is tactical field training. It is this training that must be accomplished effectively, for it is fundamental to success in combat. A unit commander, however, normally gets little more than a mission-type order to guide the planning of field training.

Before starting his planning, the commander should consider certain features that are desirable in all tactical training.

All training should be as realistic as the situation will allow and must be planned in detail prior to execution.

Hip pocket operation may be fine for combat, but only wastes gasoline and the troops' time in training.

High standards should be set and only correct actions practiced.

Junior leaders should be given every opportunity to develop and use initiative; but the knowledge of the more experienced members of a unit should be used to guide this initiative.

Every effort should be made to develop teamwork and the chain of command, to include the training of personnel in depth for key positions. If possible, competition should be used to raise interest.

ARMOR
September-October 1963

A Single, Basic Principle

Despite all the material, written and spoken, to which most of us have been exposed during our careers on the subject of training, it is my personal observation that the conduct of solid, down-to-earth training is still the thing most of us do least well of all our military duties.

That this is the situation, I feel, is not so much the result of the military instructor not wanting to do well but, rather, of his failure to learn and apply a single, basic principle, which I state as:

"Instruction on any subject, to be effective and worthwhile, must give the student a body of fact or valid techniques which, if mastered, enable and require the student to perform one or more actions."

ARMOR
March-April 1965

Frequent Practice

If we have employed most of our time in drilling in the usual mounted movements, as prescribed in the Cavalry Drill Regulations, and neglected combat exercises dismounted, then war will find us unprepared; for men cannot learn these duties, the necessary team-work, from a few perfunctory exercises, but must learn them from frequent practice. Neither can officers and noncommissioned officers expect to know these duties by learning them only from a book. They must have as much actual practice as the man in ranks.

THE CAVALRY JOURNAL
July 1920

Combat Teams

We cannot expect too much of machines alone. The finest equipment in the world is literally worthless without technicians trained as soldiers—hardened, seasoned, and highly skilled in its maintenance and operation.

Once the soldier is trained to his weapon, he becomes a part of a highly developed combat team of infantry, artillery, armor, and air. These battle teams are the most difficult, the most complicated of all teams to create. They must be capable of operating on unfamiliar ground, in darkness as well as in daylight, amid incredible confusion, danger, hardship, and discouragement. The leadership of such teams is of the utmost importance; it requires judgment, intelligence, courage, integrity, and resourcefulness.

ARMOR
January-February 1952

Armored Fighting Vehicles

Tanks and other fighting vehicle units now form part of all armies; this new arm, while firmly established, seems as yet unable to act without the cooperation and protection of other arms.

Fighting vehicles require time "to prepare for action," and carefully thought out arrangements for deployment. While possessing firepower, they can only attack; and their ability to act against consolidated positions is limited by a number of factors. They can no longer just crash through a defended position. The bullet of the modern antitank weapon can under favorable conditions pierce the armor of ordinary fighting vehicles, which no longer possess the invulnerability that was originally theirs.

They cannot defend positions or hold captured ground; in fact at rest, they cannot even defend themselves. This is one of their greatest weaknesses.

When forming part of a force defending a position, they are best held in reserve for counterattacks and for action against hostile tanks.

They can cover long distances at a stretch, and (in favorable weather) move across difficult country; but their action is limited by the problems of supply and maintenance, and by the train of park and workshop impedimenta that has to follow in their wake. They require periodical refilling with petrol and oil, and time for essential overhauls. Their mobility cannot exceed that of their accompanying transport.

The Cavalry Journal
January-February 1940

A Tracked Reconnaissance Vehicle

The thought has been expressed that now, after many years of intensified experiment, it has been proven that the effectiveness of wheeled vehicles off the road is limited. It would appear proper, in accord therewith, to initiate, without further delay, energetic efforts to perfect a lightweight tracked vehicle that accommodates itself to the requirements of reconnaissance. Should not such a vehicle possess the following qualifications?

A maximum road speed of 50 m.p.h.

A rubber tread track with a minimum life of 5,000 miles under average conditions.

Quiet in operation.

Ability to operate through water up to 30 inches in depth, or preferably 3 feet in depth.

Armed in vital areas against small-arms fire.

The Cavalry Journal
May-June 1940

The Spectre of Isandhlwana

by Captain John R. Drebus

In the Republic of South Africa there stands a stark, sphinx-shaped mountain identified as Isandhlwana. Beneath this prominence, on 22 January 1879, a British and native military force of 1,800 men met the onslaught of over 20,000 fierce Zulu warriors. Despite odds of nearly 20 to 1, the British repeatedly repulsed the Zulu attacks....

In 1977, the Ammunition Initiatives Task Force published their comprehensive study of ammunition resupply. A survey contained within the study stated that "respondents from armored units displayed more dissatisfaction with ammunition resupply generally and with ammunition vehicles and packaging in particular than did respondents from the other branches." To dispel this dissatisfaction, the task force made several strong and specific recommendations. Near-term suggestions (through 1980) were to reduce ammunition overpack and design a rapid access lid for the fiber container. Proposed long term improvements included the intergration of packaging with vehicle stowage racks, horizontal orientation of palletized rounds (allowing direct access), and size standardization of like caliber containers. The near term has passed with no visible results, which bodes ill for long-term innovations.

...Ironically, it was lack of ammunition at the firing line that turned the decision against the British; ironic because the wagons immediately to their rear contained approximately 480,000 rifle cartridges. Half a million rounds, shipped thousands of miles from another continent, were available but inacccessible....

The Tank Forces Management Group, headed by Lieutenant General (Ret.) James G. Kalergis, in its 1977 report criticized the materiel community for not markedly improving tank ammunition packaging since 1915. Their report disclosed that for every ton of ammunition delivered forward, ½-ton is packing material comprised of pallets, wooden boxes, and fiber containers. Tank rounds are inaccessible until this packaging is broken down—a tedious, time-consuming, and back-breaking task. The byproduct is a mound of uncamouflaged refuse. The report recommended the development of user-oriented packaging that would limit personnel exposure, shorten rearm time, and reduce the amount of packing material left at front line locations. Unfortunately, our 1980 production lines are still geared to the 1915 vintage package.

...The regimental ammunition reserves were well packed to protect the precious cartridges. "Sturdy wooden boxes held 600 rounds; they were two feet long, seven inches wide and nine inches deep, they weighed eighty pounds full and were equipped with rope handles at either end. The lids were held down by two strong copper bands, each secured with nine stout screws."[1] Opening the lid required the removal of six screws and corrosion often made this a difficult task....

During a 1974 ammunition packaging seminar held at Rock Island Arsenal, the Infantry School representative asked the participants why they had disregarded his simple request to place rope handles on TOW missile crates. He had made this request to the same group 4 years earlier. Perhaps a clue to the delay is revealed in the briefing given by the Picatinny Arsenal representatives who stated, "Cost effectivenss is the *primary* goal, with verified deficiencies as the *other* consideration, in packing design development." (Emphasis added.)

...As ammunition ran low on the line, hastily formed details ran back to gather additional rounds in what soon became a desperate and tragic struggle: "There were no extra screwdrivers, and it was slow work. Chelmsford (the commander) had requisitioned spare ones for this very purpose, but the order was lost somewhere in Natal. The men hacked at the copper bands with axes or thrust bayonets under them and attempted to snap them or prize them up over the screwheads"[2]....

Early in the 1970's, the Thomas Closure Corporation developed a small metal device which quickly, easily, and safely severed the steel bands and wires securing ammunition pallets and boxes. Cost was estimated at roughly 30 cents per

cutter. The Artillery and Armor Schools enthusiastically endorsed the item and by 1974 the only remaining procurement question was unit of issue. Three years later *2.8 million* strap cutters had been purchased (NSN 5110-00-132-1535). These were to be factory attached to palletized ammunition for the convenience—indeed the necessity—of the ultimate combat arms user. An armor captain who had the opportunity to use the device praised it, saying, "It's one of the best things they've ever done for the field soldier."

Only a small number of the strap cutters were ever issued, however, for the program was abruptly terminated by Army staffers who feared ammunition "pilferage" during shipment. When it was suggested that the strap cutters be attached not at the factory but rather at the Ammunition Supply Points, the ASP managers declared that they had no use for the devices. Today there are no Thomas strap cutters being distributed to the field and steel band cutters are scarce. Soldiers must often resort to axes, crowbars, and pliers for the cutting task.

..."A trickle (of ammunition) was starting out to the companies, but it was not enough. More and more men were coming back in desperation, searching the wagons until they found the familiar crates and pounding the boxes apart with stones when they found them. The fire in the line began to slacken'"[3]....

The Armor Development Plan (1979) outlines improvements the tanker and aviator would like to see in ammunition packaging. Suggested are the use of modern plastics, foams, and steels to create containers which afford protection against environmental deterioration, chemical contamination, and fragment impact. These containers must be camouflaged, easily identifiable, and manageable by material handling equipment.

Most importantly, however, they must require minimal handling in the forward areas. The Armor Development Plan also prioritizes about 180 diverse technological opportunities for improving armor force operational effectiveness. Of these 180 areas, improved ammunition packaging is ranked within the top nine for its potential impact on improving the armor force.

...The result was inevitable. In the words of Zulu witnesses interviewed after the war, "At first we could make no way against these soldiers, but suddenly they ceased to fire; then we came round them and threw our spears until we had killed them all'"[4]....

The Israelis utilize an injection-molded plastic pack which gives rapid access to 30 bare, clean rounds at the tank. If desired, five round increments may be dropped off for prepositioning. The British have adopted a container which, like the Israeli pack, allows rapid horizontal removal of bare rounds. This packaging need never leave the transport vehicle—no fuss, no mess, no delay.

The Germans have created a plastic, aluminum reinforced container which they are considering for their new 120-mm tank ammunition. None of these systems represent the ultimate perfect package. The important distinction is that the Israeli pack is fielded and the British container entering production. The U.S. Army still has fiber containers in wooden crates.

...During the afternoon while the battle of Isandhlwana raged, the moon partially eclipsed the sun[5], casting a shadow over the struggle....

Inertia and indifference seem to have eclipsed efforts to orient packaging toward the user's needs. The studies have been completed, the problems stated, and the solutions proposed; yet the U.S. soldier still struggles with primitive, obsolete packaging.

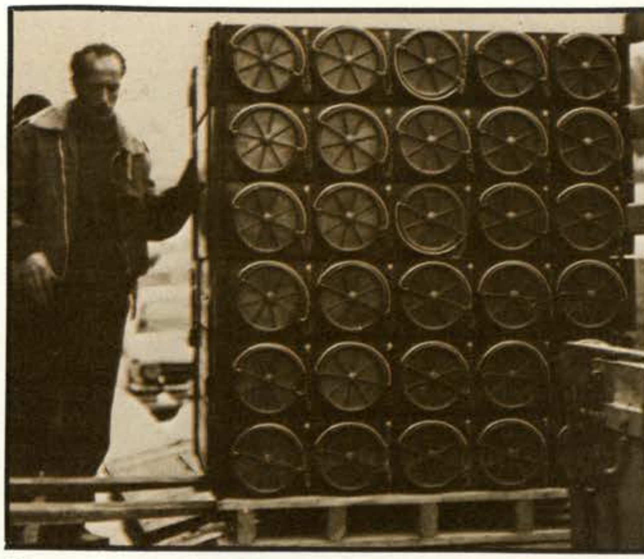


Figure 1. Israeli 105-mm tank pack for main gun ammunition.

We must allocate the funds for producing satisfactory if not ultimate containers. Partial fixes such as the Thomas strap cutter must be applied to existing stocks.

Most importantly, the final product must be integrated with other developmental programs such as armored rearm vehicles, new tactical trucks, material handling equipment, and even the weapons themselves. It is the package that is common to all of these systems. It is the package which will either glue together or fragment apart supply system effectiveness.

...Tomorrow, we may be asked to fight a desperate battle, outnumbered and against heavy odds. When ammunition runs low on the line and we turn around for resupply, will we find it readily accessible?... or will we face the spectre of Isandhlwana?

Footnotes

[1] Donald R. Morris, *The Washing of the Spears.* Simon and Schuster, New York. 1965 . p. 297.

[2] Ibid, p. 373.

[3] Ibid

[4] Rupert Furneaux, *The Zulu War: Isandhlwana and Rorke's Drift.* J.B. Lippincott, Philadelphia, New York. 1963. p. 87.

[5] Ibid, p. 79.

CPT JOHN R. DREBUS was commissioned in Armor after graduation from Indiana University in 1973. He has served as a tank platoon leader, support platoon leader, and battalion S-1 while assigned to the 1st Battalion, 68th Armor. A graduate of the Armor Officer Advanced Course, CPT Drebus served with Studies Div, DCD, USAARMC, and now commands Hq. and Svc. Co., 1st Tng Bde, Fort Knox.

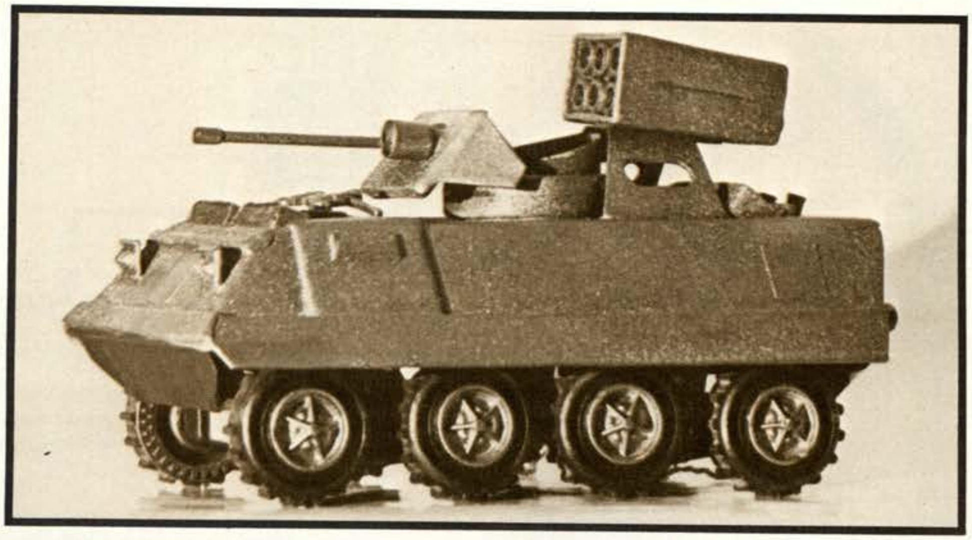
FAST TROOPS

by Lieutenant Colonel (Ret) Burton S. Boudinot

In 1966, a paper was presented at the U.S. Army Command and General Staff College suggesting a scenario that required Presidential action to rescue U.S. military and government personnel cut off by insurgents in a small country receiving United States economic and technical assistance. The action depicted the local government's troops failing to contain the insurgents, resulting in a request for U.S. military intervention.

In response to the request, the President committed a light airborne brigade, but it was contained in the area of its landing

Concept for four-man vehicle with externally-mounted automatic cannon.



Concept for a three-man antiarmor vehicle with an automatic cannon and missile pod.

Model of concept for a two-man light armored vehicle with a remote automatic cannon and an external automatic missile launcher.

zone by the insurgent force's sudden, unexpected employment of armored units.

The President then asked the Joint Chiefs of Staff (JCS) how quickly "fast troops" with an armor and antiarmor capability could be deployed to the area. The paper then outlined an organizational concept for an armor unit tailored for strategic deployment.

"Fast troops" can denote airborne, air and armored cavalry, or marine units so designated because of their ability to deploy rapidly. The term "fast troops" is not new, but it will have broader meaning in the future. Characteristically, units in the past that were lightly armed, quickly responsive to orders by moving their elements on short notice were representative of "fast troops."

These units had limited offensive power and were not organized or equipped to sustain themselves for extended periods of time. Historical examples for armor would be the colorful dragoons of the 1800's, mechanized cavalry of the 1930's, and divisional reconnaissance and light tank units of the 1940's.

Lightly armed and armored units in the U.S. Army often suffered heavy casualties when employed in sustained combat. However, their responsiveness and ability to perform diverse missions became a popular potential with field commanders.

Ironically, this potential was greatly responsible for the demise of highly-mobile recon and cavalry units. To be a light, mobile armor fighting unit, the organization had to be so equipped to be mission-oriented. The U.S. came out of World War II and then Korea where recon and cavalry units had been frequently employed beyond their mission capabilities. They had often been employed as elements of a main battle unit or in an economy-of-force role to a point that decimated their stated potential. A new trend was bound to evolve.

By 1960, survivability of armor on the battlefield became a primary concern, especially for cavalry. Armor protection became a priority in our defensive posture in Germany and Korea. The light tank was removed from the U.S. cavalry organization in Europe, and the heavy tank battalion was introduced. The cavalry scout lost his jeep to the clumsy *M-114* armored vehicle, which quickly cut his effectiveness for reconnaissance in half.

The threat of Soviet weapons and their mass have dictated the direction of U.S. armor development for 2 decades.

Several schools of advocates solidified in the 1960's:

• *Survivability on the battlefield is a function of armor protection against Threat weapons.* This premise has had a strong following, mainly when considering a high-intensity conflict in Europe.

• *Vulnerability of an armored vehicle is a function of mobility and agility and is related to its survivability from Threat weapons.* This is a small, dedicated group who portray armored vehicles in a different configuation than it is.

• *Threat vehicle domination of the battle area can be severely curtailed by proliferation of light and modern antiarmor weapons.* This defense-oriented group contends that missiles, mines, and artillery can defeat the power of massed armor.

Let's review survivability of U.S. armored vehicles with emphasis on armor protection. The Soviet threat (*a la* Fulda Gap)

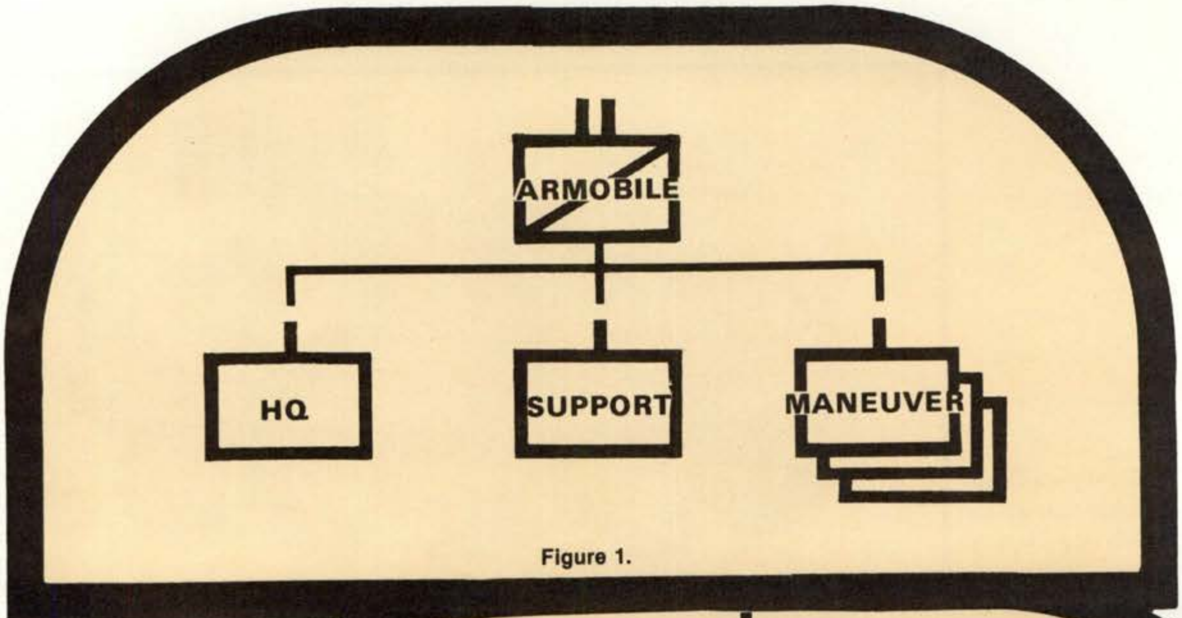


Figure 1.

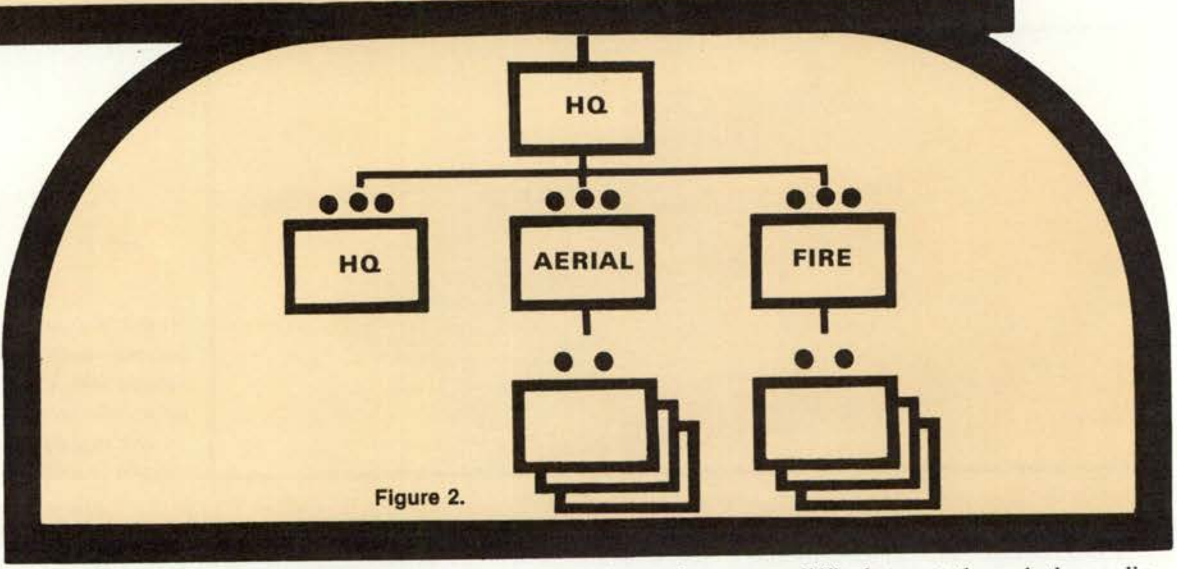


Figure 2.

is tanks and more tanks in the attack supported by fully motorized forces. It was of course logical that a "less but better" development philosophy would evolve. The U.S. would develop and produce fewer tanks with superior guns, fire control, and armor protection manned by highly-trained crews. This premise dominates the doctrinal and technological sphere of influence for U.S. armor vehicle design.

The idea was mostly uncontested until the gap in technology began to close, i.e., the Soviets with more in numbers, are developing more sophisticated tank weapons. U.S. policy has not and will not readily accept a one-for-one ratio on the battlefield so the strain is on U.S. technology to prove continually that the "less but better" concept of armor warfare is viable.

Some might not be aware that the *XM-1* did not start out on paper as a 60-ton tank. After the final demise of the *XM-803 (MBT 70)* in 1971, the armor community stated it was interested in a cost-effective, highly-mobile, hard-hitting tank of about 35 to 45 tons. The order of the day in 1972 was back to the basics. Data from several agencies, however, quickly reiterated the Threat which affected the criteria in designing a tank. Armor protection gained priority over mobility and the *XM-1* grew in weight to 50 tons plus. Its mobility, on the other hand, is a proud measure of technological progress. The *XM-1's* speed and agility is almost unrealistic for a vehicle of its weight and dimensions. In 1972, survivability by being less vulnerable to hits from Threat weapons was more critical than attempting to be a more difficult target through the application of mobility and agility.

It is interesting that during the 1960's and 70's there were strong voices that were convinced that the mobility and agility of an armored vehicle could reduce its vulnerability, thereby increasing its survivability. There are several agencies in the U.S. that have attempted to measure mobility and agility as a function of survivability. These agencies studied evasive maneuvers, line-of-sight intervisibility, and dash techniques as they relate to a probability of hit. Studies and tests have also been conducted in England, France, Germany, and other nations. At the time of the "Main Battle Tanks Task Force," mobility data played a major role but survivability utilizing armor protection dominated the design parameters.

It was thought for a long time that high mobility and agility in combat could only be realized from a very light armored vehicle. This resulted in a dilemma among combat developers. The *XM-1* has disproved this thinking to a great degree. An important question now is can a smaller, less-armored vehicle, with greather mobility than the *XM-1,* "dodge bullets" and survive?

It is true that the U.S. armored car and light tank in World War II and Korea did not stand out as highly desirable mobile weapons systems. Their firepower was limited and they were vulnerable to enemy direct fire. Their survivability in close or sustained combat was not considered good overall. The *M-24*

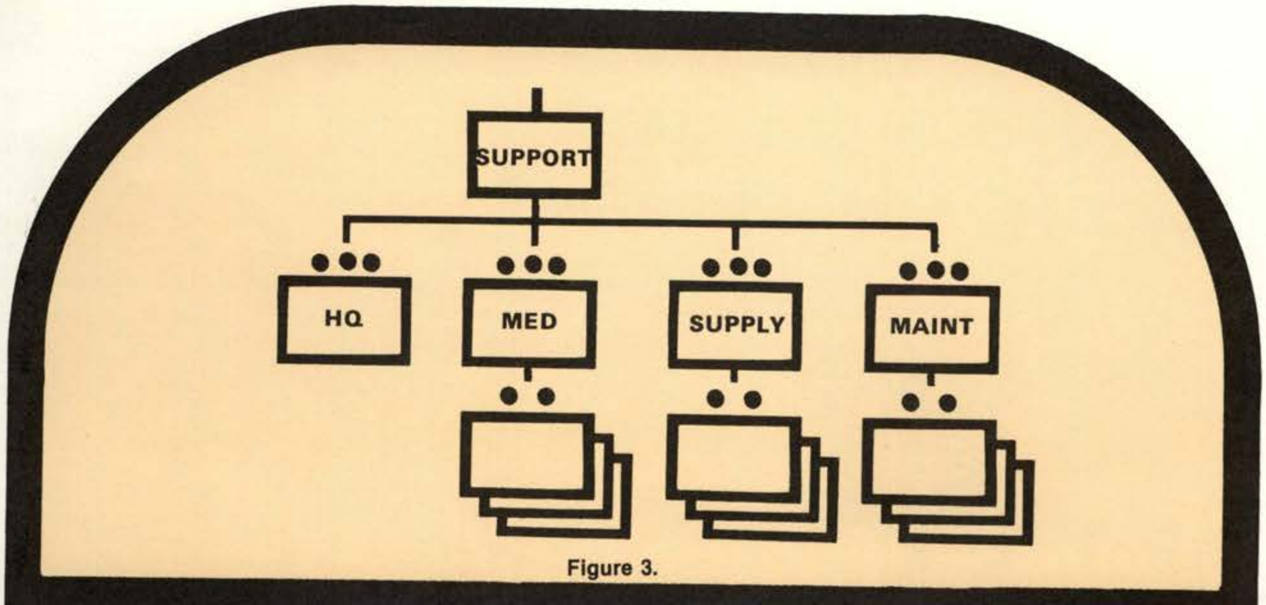


Figure 3.

light tank developed during World War II took the brunt of initial fighting in the Korean conflict. The vehicle was small and very fast on the road, but it had poor crew protection, and its 75-mm gun was far from acceptable as a tank weapon. The *M-41* light tank with an excellent 76-mm gun never had a chance to prove its potential until Vietman, 18 years after it was developed and issued. In 1959, the *M-41* was removed from cavalry units in Germany because it was considered too vulnerable to the Soviet *T-54*. One can see the reluctance to accept lighter armored vehicles as survivable weapons systems. The long and expensive armored reconnaissance scout vehicles (ARSV) program was a victim in many ways of the "survival school."

In any case, weapon systems, fire control, power trains, and suspension systems characteristic of a lighter armored vehicle have progressed in the past several years to a point where such vehicles can be formidable opponents. We are learning that if we can put the systems together right, lighter mobile weapon systems can survive. How much lighter is the question.

It may be a whole new ball game for the lighter armored vehicle, as is being demonstrated by several European nations.

The mobility and agility of lighter armored vehicles are complemented by their air transportability for rapid strategic deployment. This deployment potential has been for the most part ignored by U.S. armor development. The *T-92* in 1950's and the *M-551* in the 1960's were developed with rapid or strategic deployment in mind. The *T-92* was never produced and the *M-551* to date has not lived up to its potential. It is obvious that in the 1980's armored combat vehicles for strategic development will evolve into hard reality.

Unfortunately, armor organizations today are for the most part so equipped and supported as to make them limited in their capability for rapid deployment. The weight and volume factors, time phasing, and aircraft required to react to a strategic situation which calls for immediate deployment of a tactical armor unit are dangerously excessive. Unfortunately, planners and developers have known for years of this limitations in the U.S. military force structure.

Armor and its mobility potential must be a two-edged sword.

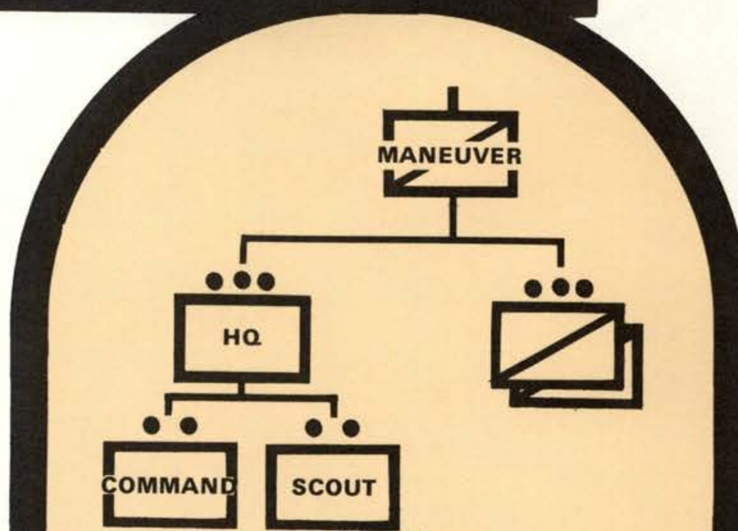


Figure 4.

There are places where armor units as currently equipped in their present formations happen to be located where hostilities might commence—such as Europe and Korea where battle will be close-in and violent. In those areas, armor units and their main battle tanks will be responsive and mobile. But in the future years of continuous power struggles how many areas in the world are there where the United States will be compelled to be ready to deploy an armor-supported military force? How many times should it have been ready to do so in the past 20 years? Only now has the U.S. Army seriously begun to prepare its armor force for multimission contingencies in the 1980's and 90's.

For the past decade, the trend in many armies of the world has been toward lighter wheeled and tracked armored vehicles and the development of more effective methods of defeating threat armor without total engagement of its main force units. Most of these nations do not have a strategic contingency requirement for their military forces, certainly not global deployment. Their design and production of smaller lighter armor has been mostly for economic reasons.

On the other hand, the United States must be prepared to

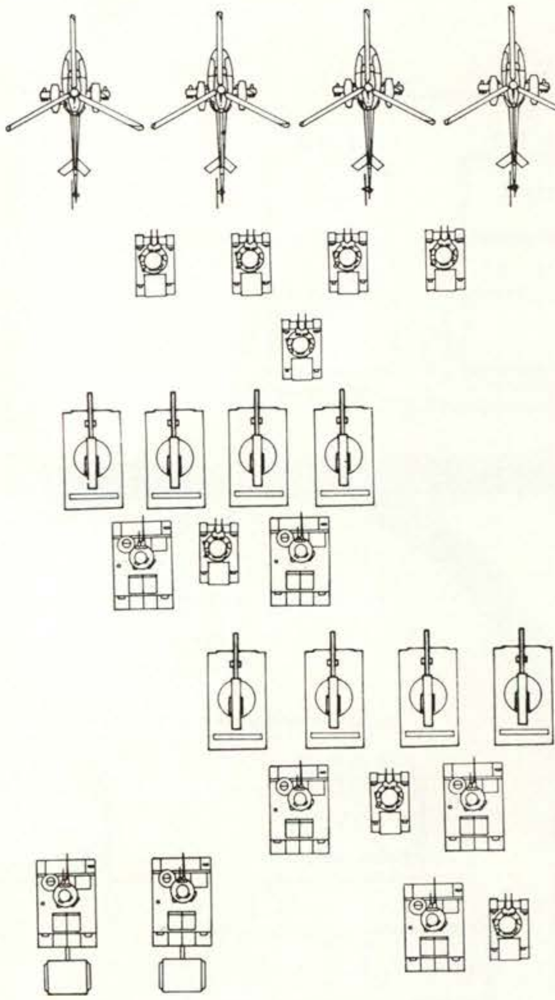


Figure 5. Airhead assault team—armobile maneuver troop with support.

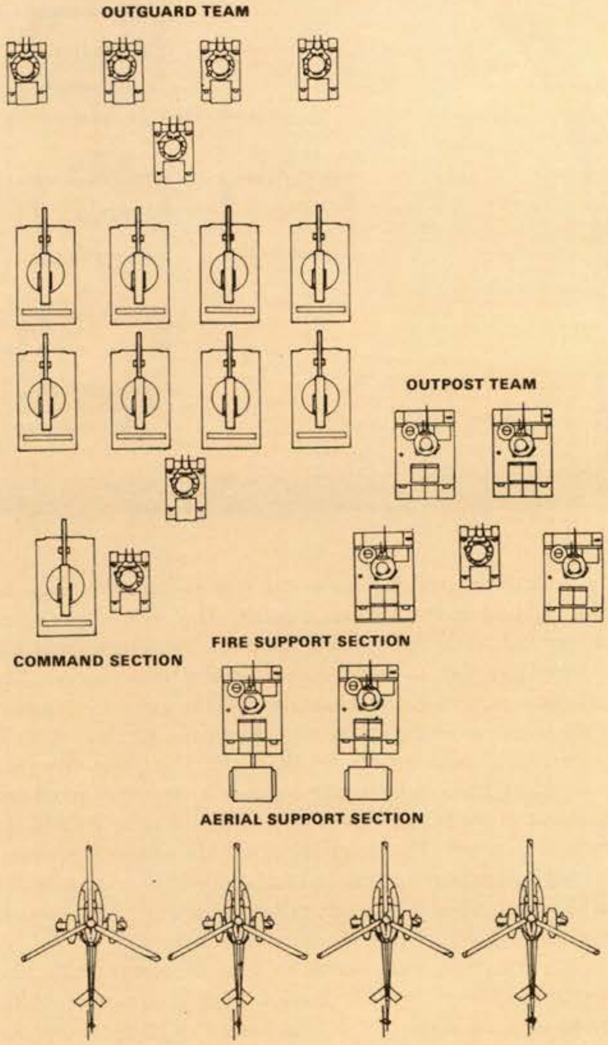


Figure 6. Maneuver troop teams with support.

deploy its ground combat forces to the far reaches of the earth if it is to honor its treaty commitments and maintain its national security.

The tank and its combat power as we know it today has proved itself as a decisive weapon, and it is not going to become an obsolete weapon in this century. When located and prepositioned in the right places, it is a most formidable battlefield weapon.

However, the research and development community has a problem. The tank in its current configuration does not satisfy all the roles that armor must play in an increasingly complex world. The premise of the U.S. Army's study that justifies a need to develop a hard-hitting, lighter tracked or wheeled armored vehicle is sound. Additionally, the recognition of the need for versatile vehicles to equip units capable of fulfilling a number of operational concepts and providing a strategic deployment capability is long overdue.

A word is in order here about the proliferation of antitank weapons in the battle area. This is an area of concern in developing and fielding light armored close-combat vehicles. The defense syndrome is a result of the advocates who believe that massed armor can be defeated by a massive antiarmor defense. The battlefield, they are convinced, can be made untenable for tanks and other armor vehicles. We are told that we have reached the point where a projectile can be developed to defeat the armor protection it is designed to defeat. We have at times allowed the defensive tactician to dominate military thinking. The close-combat armored vehicle has a number of missions as part of an overall force. It must be able to defend, but it will be employed primarily to help take ground, destroy the enemy by fire, or undermine his will to fight, or all of the above. To accomplish this, it must be inherently offensive in design. In regard to lighter armored vehicles, our guidance for the future may be closely associated to two legendary gun-

fighters in a street duel.

Agility, weapon accuracy, and proficiency of the opponents were critical to the outcome.

A hit anywhere on a man was a crippling or fatal blow. The idea was to hit but not get hit.

In 1980, we are more willing to accept the premise that a mobile and agile armored vehicle, manned by a proficient and disciplined crew, can survive with less weight, volume, and protection than we would have been willing to accept heretofore. If what we suspect proves out, then procurement cost, life-cycle cost, numbers in the field, and flexibility of missions will be favorably affected.

Let's look at what is emerging. A great deal of important data was gained from the ARSV and the S-Tank Agility and Survivability (STAGS) test and now from the High Mobility, Agility Test Vehicle with more information coming from the High Survivability Test Vehicle—Lightweight. The Army has approached these test beds realistically. The ongoing armored combat vehicle technology study is complex but will provide measures from which the Army can make a sound decision on smaller lightweight armored configurations and associated weapon systems for the future.

I will postulate on what we will see in the future. The Army, after careful study and testing, will justify the requirement to develop and field a lighter armored weapons system to satisfy several operational needs. Such a concept will fulfill the role of a reconnaissance/escort vehicle in mid- and high-intensity combat. It will also serve well as an armored assault vehicle in rapid deployment situations when task forces have to be tailored for intervention.

Armored cavalry has been uparmored and upgunned as a result of the Threat, and there is a question by some as to what degree reconnaissance in the true sense of the word can be performed.

An escort will employ the "outguard" approach using its high mobility and firepower to take on targets that main battle tanks should not have to contend with. The tanks and infantry fighting vehicles are the ground-gaining power in offensive combat. The escort vehicles as part of a cavalry organization or light armor battalion could engage an array of targets along an axis of advance or on the flanks. The escort concept is sort of a fast gunship in the arena of ground combat.

The armored assault vehicle approach offers planners a much-needed capability for "fast troops" to be inserted into an airhead with high mobility and firepower. Such a show-of-force may be a primary objective in a rapid deployment situation. As an example, the sudden appearance of armor troops has had effective results several times for the Soviets in the past 20 years.

In order to stimulate thought and dialogue on the subject, the reader is presented the "Armobile Concept."

The "Armobile" Squadron is a unique mix of elements equipped and trained to be airlifted and deployed as a highly mobile ground force that includes armor-protected elements. (figure 1).

The headquarters troop consists of a HQ platoon, aerial support platoon, and fire support platoon. The aerial support platoon has three sections of four light helicopters each. The helicopters can be rapidly prepared and stowed for movement by strategic aircraft. The fire support platoon has three sections equipped with two armored carriers, each mounting a mortar and a homing missile launch system (figure 2).

The support troop consists of a HQ platoon, three airmobile support platoons, supply, maintenance and medical, each organized into three teams. Organic helicopters provide the capability of supporting the three maneuver elements independently and at the same time (figure 3).

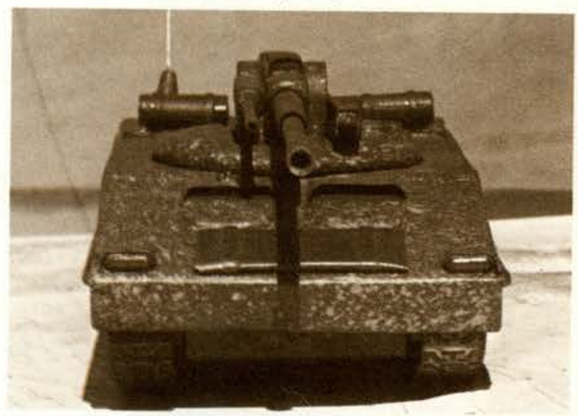
The maneuver troops consists of a HQ platoon with a command section, a scout section, and two maneuver platoons. The maneuver platoons are each equipped with four recon/escort and assault vehicles, each mounting an automatic cannon; and automatic antitank vehicles, each mounting an automatic cannon and automatic antitank missile launcher; two light infantry fighting vehicles, with squads; and a command and reconnaissance vehicle. The scout vehicle is equipped with five highly-mobile, light armored wheeled vehicles (figure 4). Other configurations of the troops are shown in figures 5 and 6.

Figure 5 depicts a maneuver troop with aerial support section and five support sections attached.

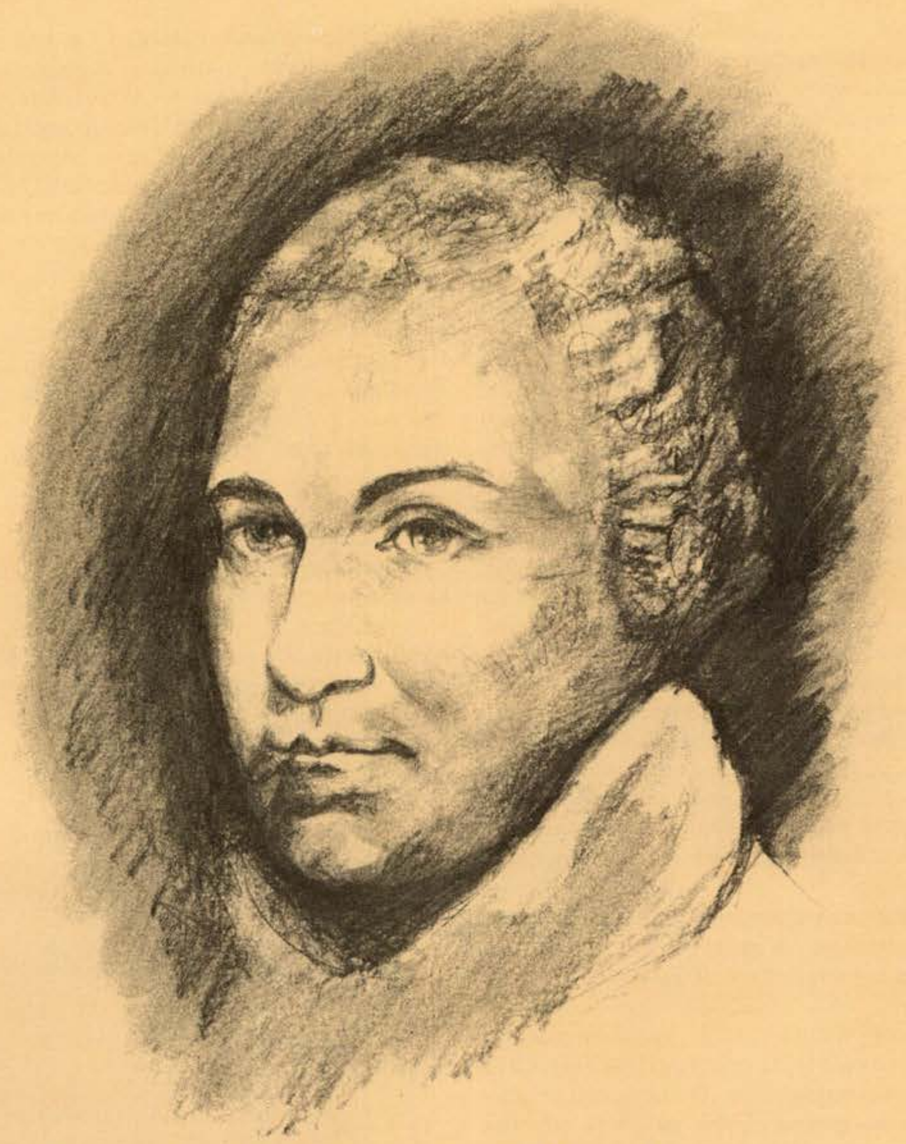
Figure 6 depicts a scrambled maneuver troop such as might be used for a security mission.

In summary, we can speculate that lives, governments, and nations might be saved and international entanglement avoided by the timely deployment of a mobile military force. Sudden and deliberate action is very disarming to an individual, a crowd, and even to a nation. The speed and movement of highly mobile, properly equipped troops is a critical objective for the U.S. to pursue.

Vehicle concepts by author



BURTON S. BOUDINOT retired as a Lieutenant Colonel after 26 years in Armor. He held command positions up to squadron level and served on the Joint Staff in Vietnam. He spent several years in armor combat developments and several as Chief of Armor Testing at the Armor and Engineer Board, Fort Knox, KY. He ended his career as Editor-in-Chief of ***ARMOR*** Magazine for 4 years. Once in the Army R&D Specialist program, he is currently working as a staff member of BDM Corporation at Fort Knox.



A Master of Cavalry – "Light Horse Harry" Lee

by Captain John Weisz

"Light Horse Harry" Lee was a *modern cavalryman.* His legion represented a Combined Arms Team of equal numbers of dragoons and light infantry and occasionally a light artillery piece or two that corresponded roughly in capabilities to our contemporary cavalry units. The artillery might not have matched the fire power of our organic mortars, but the "impression" it made on an 18th century battlefield produced the same desired effects.

The missions of Lee's cavalry were classic. Then, as now, they reconnoitered, screened, delayed, and occasionally attacked or defended. Their primary job, of course, was to gain maximum information about the enemy while denying him all access to friendly intentions. These were difficult tasks, to say the least, and only hard fighting, resourceful planning, and daring execution produced the desired results. Consequently, cavalry of Lee's era established the standards of professionalism and *esprit* over 200 years ago that set the cavalry apart from all other units today.

The threat faced by Colonel Lee in the 1770's and the American cavalry leader of the 1980's is very similiar. Lee confronted an enemy superior to his forces in numbers, maneuverability, and training. Banastre Tarleton led his regulars in a thoroughly professional manner and was supported by a reliable force of British infantry and an extensive supply system. The Americans were initially on the defensive and had to fight hard and take tremendous risks to recover the initiative. We take "Light Horse Harry's" campaign and his feats of endurance and daring—in essence, his legend—to mind and heart as an example of what American cavalrymen can accomplish.

"Leaders of cavalrymen at all echelons must have mental mobility and responsiveness to command. . . .

Cavalry leaders must think in kilometers, remain aware of the tactical situation in adjacent areas, and know enemy tactics as well as the enemy knows them.

FM 17-95, L-3

Lee's first mission in the Southern Campaign was to screen the left flank of Nathanael Green's army in its retreat to Virginia in early 1780. The exhausted and green troops blundered into a near fatal trap at Reedy Fork when they were trapped on the wrong side of the river. Sensing impending catastophe for half of the entire Continental Army in the southern states, Lee took charge and quickly deployed several light infantry battalions along with his own legion to cover the rear of Otto William's retreating Maryland regiments.

Aching to give Ban Tarleton a lesson in "grand" cavalry tactics, he professionally stationed his cavalry to the rear with sharpshooters supporting the infantry at the ford.[1] As the British crossed, they were severely punished by the American infantry, who, in turn, were driven off. The sharpshooters halted Cornwallis' regulars dead in their tracks. Only British leadership spurred them to move on again. Harry gave the redcoats his own brand of "bounding overwatch" in reverse by alternately pounding them with rifle fire and cavalry charges in a 5-mile rear guard action that saved the American effort in the south from being crushed by Cornwallis' seasoned and disciplined army. The British leaders paid the ultimate tribute to Lee's successful rear guard and harassing actions by acknowledging that they were dealing with a professional soldier. In both Tarleton's and Cornwallis' dispatches they complained bitterly of the annoying tactics of Lee's legion.[2]

"Mental mobility includes. . .

- *Boldness of concept and execution.*
- *Foresight and swift decisions."* *FM 17-95, L-3*

"Light Horse Harry's" baptism of fire occurred in the gloomy days of retreat through New Jersey after Washington's defeat at New York City. Realizing that morale must be raised, and more important, provisions secured, he launched the first of many raids against British supply dumps and lines of communication. He quickly became a thorn in Lord Howe's side as he progressively fed and outfitted Washington's scanty forces.[3] He boldly struck out when the main army was retreating and encouraged his comrades by emphasizing the enemy was not invincible.

Not to be outdone by "Mad" Anthony Wayne's assault at Stony Point, Lee resolved to execute a much more audacious coup by assaulting Paulus Hook, a veritable island fortress surrounded by swamps and rivers—with cavalry, no less! Imagine the confidence Washington must have had in this young Virginian to believe he might be able to reduce this bastion, much less retreat with prisoners and booty through 15 miles of Tory-infested New Jersey countryside.[4] Nonetheless, through carefully coordinated action, determination and brilliant strategic insight, his unorthodox tactics produced a victory almost equivalent to Trenton and Princeton in even bleaker days of the revolution and bolstered flagging rebel support for the revolutionary cause.

After transferring to Nathanael Greene's Southern Department, Harry's daring exploits began in earnest. In North Carolina, he masqueraded as Ban Tarleton (both forces wore green uniforms and the green uniforms all looked the same to backwoods Tories) and nearly massacred 400 Loyalists who allowed him to enter into their midsts. Afterwards, North Carolina would never again be a fertile field for Tory recruiting.

Dismissing the prospect of storming a strong fort south of Augusta, Georgia, he ingeniously ordered an attack by unseasoned militia on the main gate of the stockade. The militia feigned retreat and when the besieged garrison pursued them, the cleverly hidden legion attacked the regulars in the open and forced the gate without loss.[5] At Fort Cornwallis, in Augusta itself, he demonstrated his capabilities as an engineer by erecting a tower reminiscent of the Middle Ages and raked the garrison with artillery firing from its heights. The town surrendered without another American casualty.

". . .There is a definite requirement to take the calculated risk. Planning must be flexible to permit immediate adjustments when things do not go as originally planned. Cavalry leaders must be able to quickly adjust to frequent and drastic changes without undue excitement, worry, or frustration. A cavalry unit leader must visualize the probable outcome of a situation and be prepared to react accordingly as the situation develops."

FM 17-95, L-3

At Paulus Hook, it seemed that meticulous planning in itself would not suffice in guaranteeing a swift and stunning victory. Actually, "Light Horse Harry's" sheer force of personality and leadership alone enabled his men to cope with the changing tactical situation and emerge victorious. Only hours before the assault, an angry major withdrew half his force due to an argument over who should command the expedition.

Undeterred, Lee carried the fort without his aid. Retreating with several hundred prisoners and valuable stores, Harry met with further disappointments. One half of his subordinates had failed to rendevous with him with boats detailed to ferry the expedition back to the mainland.

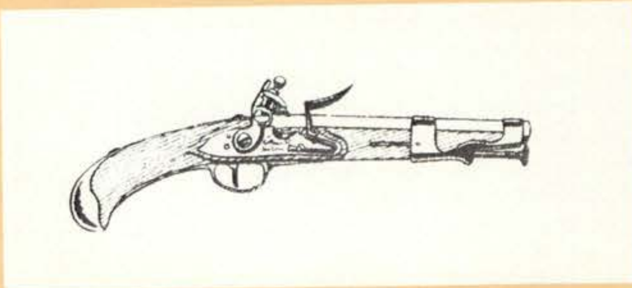
Literally dragging his men through the swamps, he wisely sent messengers ahead to effect a union with a relieving force at New Bridge. Lee's dash and luck saved him despite several additional setbacks. Finally, the Virginians, who had deserted him earlier, covered his rear until he crossed New Bridge with Tory irregulars sniping at his heels.

"He must exceed the pace of the enemy and maintain at least a five-to-one loss ratio in his favor. *FM 17-95, L-3*

Setting the stage for Howe's 1777 campaign against Philadelphia, a strong British cavalry escort screened his lordship's troops disembarking at Elkton, Maryland. Lee's cavalry was tasked to gather intelligence about enemy intentions. Using deep woods to cover his movements, it took only two pistol volleys at close range, and drawn sabres to unseat 50 enemy troops and capture 25 others at the cost of only one American wounded.[6]

At Guilford Court House he virtually fought his own little battle and inflicted 75 casualties on Bose's Hessians at the cost of only five of his own men.[7] These figures do not even reflect the trouncing he inflicted upon the Fusiliers and Grenediers that finally extricated Bose from the entire situation. Paulus Hook, Harry's boldest venture netted him 150 prisoners at the cost of two Americans killed and three wounded. Additionally, over 50 dead and dying enemy remained in the stronghold.

"Mental mobility must be combined with personal mobility. . . . The essentials of command are carried in his head and his pocket." *FM 17-95, L-3*



The Guilford Courthouse campaign epitomized this commander's mental mobility. Deeply committed to his own campaign in South Carolina, Lee rejoined his superior upon order and planned his own dispositions for the impending battle. Again interrupted in his deployment he was sent out to reconnoiter in force and fix the location of Cornwallis' main body.

Finding his pickets driven in, he quickly grasped the gravity of the situation and feigned retreat with two of his three cavalry troops. The last one turned about and fired a disciplined volley on order, gaining time for the infantry to arrive and support the cavalry. Simultaneously, the other two troops swept around either flank of Tarleton's surprised Legion and unhorsed two of the enemy's lead troops. Pandemonium broke loose and only Tarleton's presence saved his command from an utter rout.

Lee, as always in the midst of action, had his horse shot from under him. He quickly hopped on another steed and directed the battle from his new position.

At Scott's Farm, near Valley Forge, Lee and a handful of troopers barricaded themselves in a farmhouse and withstood the attack of a mounted British regiment by exaggerating their own numbers and confusing the enemy to the point where they retreated in disorder leaving dead and wounded behind. Noel B. Gerson, one of Harry's biographers, summed it up best: "In a real crisis, Harry Lee was less impetuous than he seemed. Others believed him rash, not understanding that his mind worked at great speed, enabling him to analyze a situation far more rapidly than could military plodders."[8]

"A cavalry leader must be capable of accepting a mission-type order, clearly understanding its meaning, and immediately taking necessary action to execute the order. Efficient responsiveness in cavalry requires a highly developed degree of professional competence.
FM 17-95, L-3

Lee established his reputation for technical and tactical competence early in the war. In the 2 months preceeding Trenton and Princeton, at the cost of two wounded men, he led at least 15 successful raids.[9] He had perfected the art of the raid. The men of his 5th Troop knew their capabilities and relied on one another. Most important, they knew their commander planned in detail and executed each plan perfectly.

Again, citing the preliminary skirmishes before the Battle of Guilford Courthouse, "Light Horse Harry" received the mission to pinpoint Cornwallis' location and determine his intentions. He went *beyond* that, though. By crushing Tarleton's legion, he deprived the enemy of his own "eyes and ears." Finally, in its last major battle at Eutaw Springs, the legion demonstrated its professionalism by being the only unit to hold firm in the fluctuating tide of battle. In fact, Harry, by himself, tried to carry the bulwark of the enemy defenses, the Brick House. In the greatest cavalry action of the war, only Lee's men behaved as soldiers should.

Colonel Henry "Light Horse Harry" Lee was indeed a *modern* cavalry leader. His mental mobility and responsiveness to command clearly distinguished him from his many mediocre peers. Initiative, strategic insight, detailed but flexible planning, audacity, imagination, and professionalism are the heritage he established for the American cavalry at its birth during the Revolution and these are the traits of the "modern" cavalryman who faces the "Threat" forces of today.

This author nearly forgot one more essential element of the cavalry, but Harry Lee's men did not. Secretly, during the last days of the southern campaign, the legion launched its last raid. It was a unique raid in that it was the only one Harry did not personally lead. That evening he also reacted in a very uncharacteristic manner. He *wept*. The sole objective of the raid was to procure a British officer's handsome sabre. Every officer's and non-commissioned officer's name was engraved on its blade as a parting token of esteem from his beloved legion.[10] Even the *esprit* of the legion of 200 years ago has evolved into the pride and individualism of today's cavalry.

CAPTAIN JOHN WEISZ was commissioned in Armor upon graduation from the USMA in 1974. Captain Weisz has attended the Armor Office Basic and Motor Officer Courses. He served as a cavalry platoon leader in the Republic of Korea and platoon leader and executive officer in the 5th Battalion, 33d Armor at Fort Knox. Additionally, he served on the USAARMC staff as Chief of both the Test and Evaluation and Individual Training Branches of the Directorate of Plans and Training. He is currently a captain in the Ready Reserves. He works full-time for Westinghouse Electric Corporation as a Project Director for Overseas Radar Programs in the Defense and Electronic Systems Center.

Footnotes

[1] Richard E. Wormser, *The Yellowlegs: The Story of the United States Cavalry* Garden City, New York, 1966. p. 15.
[2] Noel B. Gerson, *Light Horse Harry: A Biography of Washington's Great Cavalryman, General Henry Lee.* Garden City, New York, 1966. p. 99-100.
[3] Ibid., pp. 24-25.
[4] Wormser, pp. 6-7.
[5] Wormser, p. 22.
[6] Gerson, pp. 45-47.
[7] Thomas Boyd, *Light Horse Harry Lee.* New York, 1931, p. 85.
[8] Gerson, p. 53.
[9] Gerson, p. 26.
[10] Gerson, p. 148.

The *M-9* Universal Engineer Tractor can perform many missions in support of combat maneuver elements, including the preparation of emplacements like that at the left for tanks and other armored vehicles. The UET is amphibious and air-transportable.

Engineer Support for the Combined Arms Team

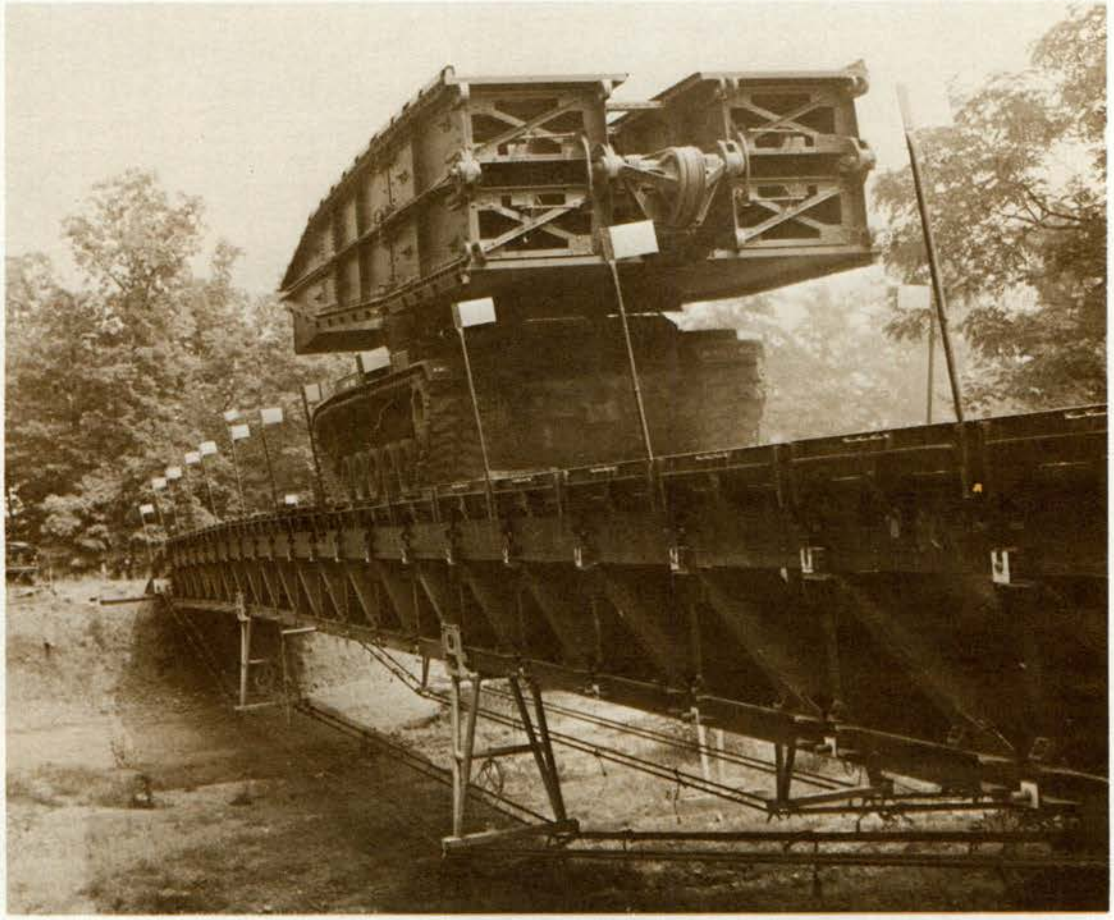
by Colonel Albert F. Dorris

In today's high technology battlefield environment no man or unit can stand alone. Interdependence is the key to modern warfare. All of the Army's combat branches must combine their efforts in a total offensive system. Engineers and Armor are a good example. On the ground, mobility enhances survivability, and survivability means the potential to attack or defend on one's own terms.

The U.S. Army Mobility Equipment Research and Development Command (MERADCOM), Fort Belvoir, VA, is responsible for research, development, engineering, and initial acquisition in four areas that are critical to mobility, countermobility, and survivability: counterbarrier systems, countersurveillance systems, energy and environmental systems, and supply distribution and construction equipment systems. Long a Corps of Engineers agency, MERADCOM has retained the development and fielding of combat engineer equipment as a primary responsibility since becoming part of the U.S. Army Materiel Development and Readiness Command in 1962.

Countermine Efforts

One of the most serious mobility threats faced by armored forces is the mine—buried or surface emplaced. MERADCOM is currently working on a number of systems to detect and destroy minefields or, failing that, to help armored equipment survive mine blasts and keep momentum. The Vehicle-Mounted Road Mine Detector System (VMRMDS), presently under engineering development, is the only mobile system that can reliably detect both plastic and metallic antitank/an-



Medium girder bridges such as this can carry class-60 loads over spans up to 106 feet when reinforced with a cable set.

This cross-country launch vehicle for bridging equipment of the eighties can transport, launch and retrieve a 30-meter span of class-60 bridging.

tivehicular land mines. VMRMDS locates buried mines through a special search head array that can be mounted on any standard Army vehicle. When it detects a mine, an alarm sounds and a visual display pinpoints the location. The system can scan a path up to 11-feet wide at a speed of up to 8 miles per hour over unpaved roads or flat, sparsely vegetated terrain.

To meet a critical need for advance detection of remote minefields, MERADCOM has explored many technologies. Photography and passive thermal imaging have demonstrated limited success against standard-pattern, buried minefields or mines emplaced in roads. With the Threat shifting to short-duration surface minefields and random-delivered mines on the forward edge of the battle area and in friendly rear areas, reevaluation of all technologies is required.

Prior to beginning a diverse technology development program, MERADCOM has developed the first computerized countermine Monte Carlo Combat Simulation Model to evaluate the relative sensitivity of new operational scenarios to different countermine options. It will be used to determine the relative effectiveness of different combinations of existing and conceptual detection and neutralization equipment. Operational evaluation indicates the program should concentrate on real-time, forward-deployed, wide-area scanning technologies, but user concurrence will be obtained prior to commencement of any multidiscipline research and development program.

If an armored, tracked vehicle encounters a buried mine, the force of the blast can sever the tracks—immobilizing the vehicle and making it vulnerable to enemy weapons. An explosive charge as small as 3 pounds can stop a 60-ton tank with a con-

A tank crew can quickly disconnect the track-width mine clearing roller system after it has been used to breach a minefield.

ventional track and suspension system.

MERADCOM, in coordination with other Army laboratories, is developing an improved track and suspension system that can withstand the blast from a 22-pound mine. This new design works on the principle of reducing the area exposed to an exploding mine and using composite components to resist the blast the system receives. It uses a single road wheel instead of the two wheels used in conventional suspensions. The wheel rolls on redesigned track shoes with metal links, individual pins, a steel yoke and an ablative composite material. By enabling a vehicle to continue its mission or at least limp off the battlefield, the new suspension could save many lives. This conceptual system technology is expected to be transferred to the Tank-Automotive Research and Development Command (TARADCOM) later this year.

Another countermine system developed by MERADCOM currently in initial production is the Track-Width Tank-Mounted Mine Clearing Roller System. The roller is about 85 percent effective against pressure-fused mines buried up to 4 inches deep when traveling up to 10 miles per hour. It can survive blasts from two 22-pound high-explosive mines. A weighted chain suspended between the roller assemblies can clear tilt rod mines. Under battle conditions, the rollers can be released from the prime mover in less than 30 seconds using a hydraulic disconnect system.

The system consists of a retrofit kit, a mounting kit, roller kit, and fixture kit. It weighs less than 10 tons and can be mounted in the field by a tank crew in less than 15 minutes for day or night use under all weather conditions. Ten roller units will be produced under the initial contract for units in Europe.

MERADCOM is also testing the British *Giant Viper* mine clearing system for potential use by the U.S. Army. The main component of the *Giant Viper* is a 750-foot hose filled with plastic explosive. This hose is packed in a wooden box mounted on a trailer. It can be towed to the minefield site by a tank or armored personnel carrier. The system is remotely fired from inside the vehicle and projected across the minefield by a cluster of eight rocket motors. An arrester gear in the form of three parachutes straightens the hose in flight and the explosive detonates after it has landed. *Giant Viper* can clear a path through a minefield about 200 yards long.

A man-portable mine neutralization system (POMINS) is in the advanced development stage. It can not only neutralize antipersonnel mines in a path 0.6 meters wide by 25 meters long, but also cut wire obstacles, a capability missing from current U.S. man-portable devices. An Israeli rocket-projected system is being used as the base line for this development. Type classification is scheduled for FY 85.

Bridging the Gap

In lateral movement and assault operations, rapidly emplaced bridging plays a critical role in mobility. MERADCOM is working with three types of bridges that will keep men and equipment moving under almost any conditions. "Bridging for 1985 and Beyond" is a joint project of the United States, West Germany, and Great Britain to develop a family of standardized wet and dry gap assault and support bridges using common components.

MERADCOM is responsible for United States' participation in this effort. The basic U.S. system consists of a support or assault launch vehicle and a 30-meter span of bridging. The bridge has a roadway width of approximately 4 meters and supports the heavy combat equipment of the *M-60* and *XM-1* tank and the *M-88* tank retriever. A 30-meter dry or assault bridge can be erected in 3 to 5 minutes using this system. At present, MERADCOM is studying ways to make the bridge lighter and stronger using composite materials.

The *Ribbon Bridge,* which is the newest fielded bridge, is currently being rating tested for a Class 70 load by the Test and Evaluation Command (TECOM). This wet support bridge, currently in use by army units worldwide, will be subjected to 5,000 crossings by 70-ton vehicles in order to insure that it can meet the future needs of U.S. and NATO equipment.

The components of the *Ribbon Bridge,* which replaced the *M-4T6 Floating Bridge,* make the system one of the most versatile in the Army. The bridge itself is made up of a series of floating modular units which are joined to two ramp bays to produce a bridge. Individual bridge bays consist of four pontons which fold up for easy transport. Ramp bays are equipped with hydraulic cylinders to permit adjustment for various bank conditions. Bridge bays can also be joined together to form a raft for ferrying equipment, men, and supplies. It takes only 1 minute to launch a bridge bay and less than 5 minutes to retrieve it with a specially modified 5-ton truck.

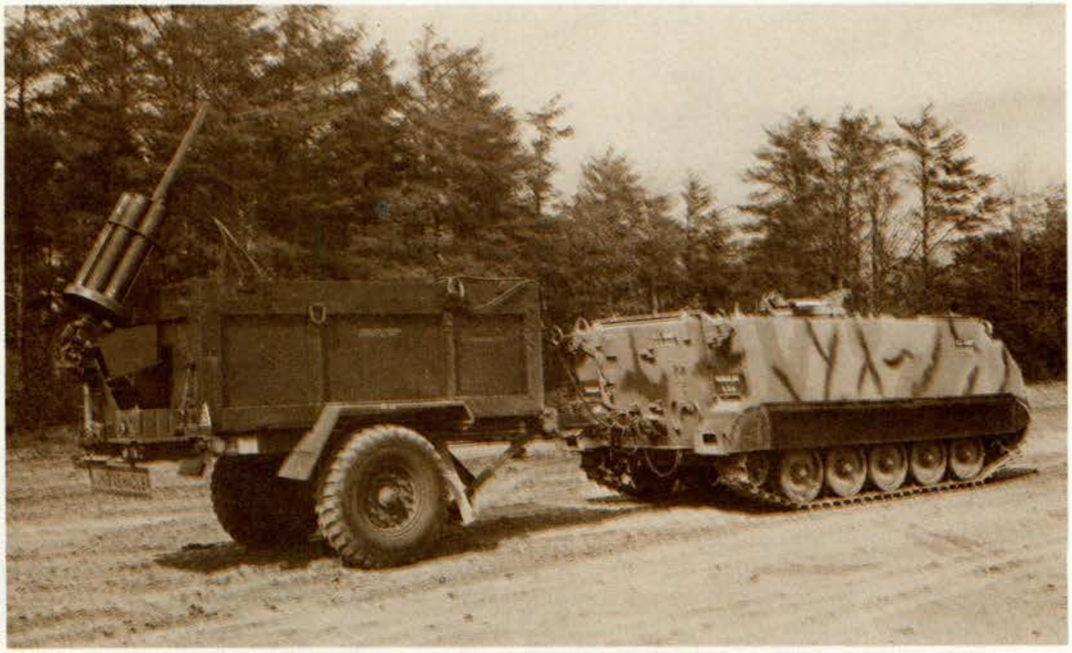
Along with the *Ribbon Bridge,* MERADCOM is developing a Bridge Erection Boat which will be used to guide the bays into place. This boat will fit on a special cradle for transport.

Another recent addition to Army bridging is the British-designed Medium Girder Bridge (MGB) which was jointly adapted by Great Britain and MERADCOM and meets U.S. requirements. One of the U.S. additions was a cable reinforcing system that extends the single span, Class 60 capacity of a double-story bridge to 49.7 meters. Multispan construction equipment has been developed to enable the MGB to be built over even wider gaps. The key is a span junction set that enables piers to be inserted so that the spans can be articulated in relation to each other. The Medium Girder Bridge is found throughout NATO and is in use in 23 countries worldwide.

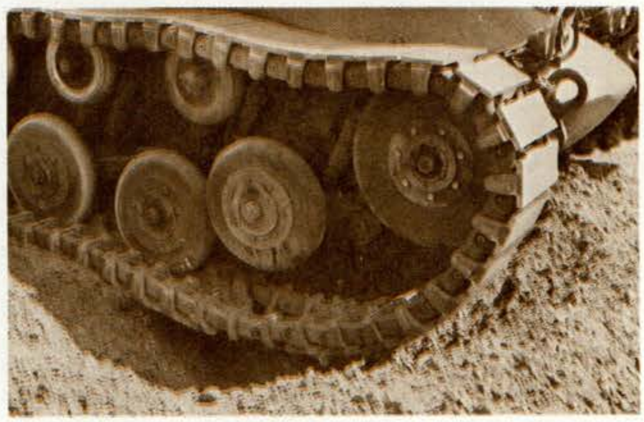
New POL Requirements

Armored units require specially designed fuels and lubricants to keep their equipment moving. The new *XM-1* tank will use many MERADCOM developments.

Fire resistant fuels--combinations of fuel, water, and a special emulsifying agent--will reduce the threat of fire and explosion if a vehicle is hit by enemy fire. Preliminary experiments led to the selection of a mixture of 10 percent water in diesel fuel stabilized with 6 percent emulsifier. The water acts as a heat sink to absorb the heat and energy generated dur-



MERADCOM is testing the British Giant Viper Mine Clearing System for possible use by the U.S. Army.



A new, toughened track and suspension designed by MERADCOM permitted this tank to be driven away after encountering an antitank mine.

ing ballistics impact.

Along with the fire resistant fuels, the Command is developing nonflammable hydraulic fluids for prototype and future armor equipment. The fluids being considered are chloroflourocarbons. Once these candidate fluids have been evaluated, their introduction into the hydraulic and gun control systems will increase survivability.

The development of new, high energy fuels or augmentation additives is a new program for MERADCOM. Increasing the calorific value of fuels will increase the range of the vehicle and improve engine performance. Single-cylinder engine tests have been conducted with some of the candidate fuels. Future experiments will be made with multicylinder engines.

Turbine engines have experienced corrosion problems with standard aircraft turbine lubricants. MERADCOM has joined with the Navy in a cooperative program to develop corrosion-inhibited lubricants. Plans call for a limited fleet test using equipment from the Army's Aviation Research and Development Command as well as several *XM-1* tanks.

Another area of fuels and lubricants research is a project to develop a multipurpose turbine engine and transmission fluid for ground vehicles. Unlike the current armor/tactical diesel-powered fleet, turbine-powered equipment requires different oils for the engine and transmission systems which cannot be intermixed.

Camouflage

In war today, what an enemy can see, he can hit, and what he can hit he can destroy. MERADCOM's Camouflage and Topographic Laboratory has some of the most sophisticated facilities in the world to provide the Army with camouflage protection. Computers, radar diagnostics, and spectrophotometers are converting camouflage from an art to an exciting science that uses technology to fight technology. Special pigments are prescribed for camouflage paints and netting that match the natural environment under near-infrared photography. Formerly, military equipment, which contains no natural chlorophyll, showed up in shades of blue when photographed with infrared film. Pigments in netting and camouflage paint now enable combat and tactical vehicles to blend with the natural scenery in both the visible and near-infrared spectral bands.

Nets and paint patterns are also customized for different vehicles and terrain. The Army has 11 colors of camouflage paint which can be used in many color combinations to suit a variety of terrain. Two hundred-twenty paint patterns have been developed for all types of equipment from howitzers and jeeps to tanks and armored personnel carriers.

Nets, which come in woodland, desert, and snow color blends are reversible to suit differences in terrain and foliage. They are made in modular forms that can be joined to fit

equipment of different sizes and shapes. Camouflage, when used properly, can save countless lives and increase the survivability of combat and logistical equipment.

Crew Comfort

The inside of a tank or armored personnel carrier can get extremely hot or very cold depending on the climate and season. Both of these conditions can hamper a crew's performance. MERADCOM, in conjunction with the Army's Natick Research and Development Command (NARADCOM) and the Chemical Systems Laboratory of the Armament Research and Development Command, is designing an air conditioned and heated suit that will protect crew members from the weather and from the hostile environment of chemical, biological, and nuclear weapons. Three designs are being considered for use by the Army, one that circulates outside air, one that uses heated and cooled air, and one that uses a liquid system for heating and cooling. NARADCOM is designing the suit itself while MERADCOM will provide the heating and cooling units. For chemical, biological, and radiological (CBR) operations, special filters, to be developed by the Chemical Systems Laboratory, will enable the crew to keep going. Tests of the three designs are expected to begin this year.

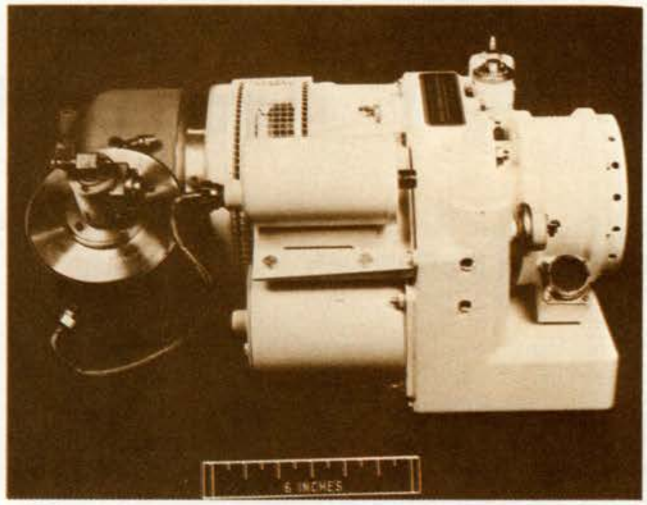
In another combined project, MERADCOM and TARADCOM are working on a 10-kW Auxiliary Power Unit (APU) which may be used on the *XM-1* tank. A 25-horsepower gas turbine unit will be tested by MERADCOM. These units will provide the *XM-1* with a low-temperature start capability. With the APU, the main engine can be started at temperatures as low as -70°F. Savings would be seen in reduced engine hours and fuel consumption. This APU turbine engine has commonality with the power plant used in the 10-kW, 60-hz GTED general purpose generator set, the 10-kW, 40-hz GTED generator set used by FIREFINDER and the proposed 10-kW, 28-volt, DC GTED aircraft support generator set.

Survivability will also be enhanced on the frontlines with the introduction of the *M-9* Universal Engineer Tractor (UET). The *M-9* is a multipurpose, tracked, armored, amphibious, combat vehicle that can perform earthmoving tasks such as dozing, scraping, rough grading, and hauling. On the battlefield it will play a three-fold role in mobility, countermobility, and survivability. The *M-9* can travel with armored fighting vehicles and keep their units moving by filling craters and ditches, towing equipment, removing road blocks, preparing access and egress for ford sites and river crossings, and preparing and maintaining combat routes and assault airfields.

These same capabilities can also be used to impede enemy forces and enhance "kill zones." The *M-9* can construct antiarmor obstacles, demolish fords and bridge bypasses, dig tank ditches, destroy airfields and landing zones, prepare strong points, and haul obstacle materials. Once the battle is joined, the *M-9* can increase the survivability of our forces by digging hull defilade positions for armor equipment, constructing defensive positions for command and control operations, constructing earth berms for protection, hauling material for protective shelters, clearing fields of fire, and digging slots for vehicle mounted TOWs. The versatile *M-9* is air-droppable and has a swim capability comparable to the *M-113*.

MERADCOM's research and development efforts offer many benefits for armor units. One important mechanism which has helped to focus the research and development programs of various Research and Development Commands to be responsive to Armor needs is the Tank Science and Technology Program Advisory Council which is chaired by the Commander of TARADCOM and has a membership consisting of the Technical Directors of the other Research and Development Commands and organizatons and Major General Louis C. Wagner, Commander of the U.S. Army Armor Center and Fort Knox.

This Council is now beginning to focus on the science and technology program required for future armor systems. Continued cooperation between Armor and Engineer developers will insure better Army readiness under the "Total Force" concept. Total Force is not only the combination of the Active and Reserve Component personnel, it is the combination of all the Army's Arms into a cohesive force with maximum impact in future battles. Major General Thomas P. Lynch, former Commander of the U.S. Army Armor Center, expressed it best when he said, "the Armor community is pleased with the definite shift, during recent years, by the combat support branches in becoming true participants in the integrated battlefield. This consolidation and streamlining of functions is certainly in line with the direction of the U.S. Army to provide a force that is lean but yet fully capable of performing its mission on the mobile battlefield. As I indicated at the 1979 Armor Conference, our success on any future battlefield cannot rest on any single system working independently. Rather it is a combination of those systems as an integral part of the combined arms force which will lead to our success."



This 10-kilowatt auxiliary power unit will be tested for use with *XM-1* and *M-60* tanks

COLONEL ALBERT F. DORRIS was graduated from the U.S. Military Academy in 1959 and commissioned in the Corps of Engineers. He has served in engineer commands in Europe, Korea, and Vietnam, as well as in CONUS. He has a MS and PhD in Civil Engineering from the Univ. of Illinois, and was an honor graduate from both C&GSC and the Naval War College. He was the U.S. Army Engineer Standardization Representative in the UK, and was chairman of the NATO Combat Engineer Working Party. He is currently Commander of the U.S. Army Mobility Equipment Research and Development Command.

Photo 1

Army Missiles

by Brigadier General Benjamin J. Pellegrini and Major Jim McCullough

The Army's Missile Command (MICOM) has the responsibility for the total management—cradle to grave—of the acquisition and support of the U.S. Army's inventory of missile systems. These systems are the marriage of the technological ideas, the soldier's needs, and industry's capabilities to produce the result. This process often takes from 6-8 years to field new systems that can stay in the inventory for over 20 years. This article gives an idea of how MICOM brings systems on-line. It will focus on those systems of particular interest to *ARMOR's* readers, and show a part of the Army's missile capability now and in the future.

Some of the many participants at MICOM who develop and maintain the missile inventory are in the technology laboratories, the Advanced Systems Concepts Office (ASCO), and the Project Manager offices. The technology laboratories start with the idea for a weapon and nurture the idea throughout its life, with detailed design work and technical supervision. ASCO is a group of military officers and scientists that keep in constant communication with the labs and user community—articulating needs and technology efforts to both groups. Once a system has demonstrated its value, the soldier has accepted it as fulfilling a specific need, and the Congress has funded the program, a project management team is created. This is a group of people with various talents dedicated to fielding and supporting a specific system in the inventory. They are a management team whose primary effort is to contract with private industry to build the missile system, while coordinating with all government agencies involved with the system.

The Army missile capabilities can be placed in three categories: fielded, in development, and emerging systems concepts.

Fielded Systems

Systems now in the field include the *M-72* LAW, *Redeye,* TOW, and *Dragon.* Every armored battalion employs each of these systems, and would commonly use them to complete a combined arms mission.

The *M-72* Light Antitank Weapon System is a small, light, and simple-to-operate weapon that can be carried and fired by

Photo 2

one man, using its disposable packing container as a launcher.

The *Redeye* missile is a man-portable, shoulder-fired weapon that provides combat troops in the forward battle area the capability of destroying low-flying aircraft. The weapon is effective at ranges and altitudes commensurate with a close-in defense against attacking aircraft.

TOW is being produced for the infantryman as a heavy antitank assault weapon system. Combining a lethal warhead with high accuracy at both close and long ranges, TOW is effective against both stationary and moving targets. The system can be broken down into units for ease of handling. The TOW launcher may be carried by troops and fired from a ground emplacement; or, it may be mounted on a variety of vehicles, including personnel carriers.

There is a specially designed launcher for firing TOW from a helicopter. With two exceptions, airborne TOW is similar to the ground version. On the helicopter, the TOW configuration consists of two modular launchers which carry two missiles each. Additional modular launchers can be attached which will permit the helicopter to carry and fire a total of eight missiles. A stabilized sight has been developed for the airborne version which permits the gunner to hold a bead on the target, even while the pilot maneuvers to escape ground fire.

A TOW improvement program is ongoing to enhance its performance through the 1980's. It will be an integral part of the Improved TOW Vehicle (ITV), currently being fielded, and the new Infantry and Cavalry Fighting Vehicles.

Dragon has been developed for the infantryman as a medium antitank/assault weapon system. It is the Army's first guided missile system light enough to be carried by one man and shoulder fired—yet, have a warhead big enough to kill


Photo 3

most armor and other infantry targets encountered on the battlefield.

Development Systems

Developmental systems are currently funded, have established project offices, and are being prepared for deployment in the 1980's. Some have just begun, are about ready to go to the field, or are somewhere in between.

Viper will replace the *M-72* LAW. *Viper* is simple, lightweight, and reliable and provides significant increases in range and hit/kill capability over the LAW. It will supplement both TOW and *Dragon* giving the soldier a self-defense system for close-in targets. The concept of employment includes high density usage of the *Viper* not only by the infantryman, but personnel in command elements, combat support units, and logistical service installations. It will not require a dedicated gunner, but will be issued as a round of ammunition. It can be employed against tanks, wheeled and tracked vehicles, and other point-type targets, like bunkers.

Viper is currently undergoing final design validation testing and is scheduled for operational testing in the fall of 1980. The first production units are expected by summer of 1981.

The Ground Laser Location Designation (GLLD) is a ground-mounted laser designator to be used for marking hard,


Photo 4

point, moving, or stationary targets with a laser. The GLLD will provide accurate range, azimuth, and elevation information for use with conventional artillery. It will have a capability to support both conventional artillery and laser homing ordnance such as Cannon-Launched Guided Projectiles (*Copperhead*), smart bombs, HELLFIRE, the Air Force *Maverick* missile, and Navy laser-guided 8-in projectiles. The system has a vehicle mount and night sight and is also being integrated into the ITV. The ITV/GLLD will provide an initial, forward observer vehicle capability under armor.

The man-portable GLLD consists of a laser designator/rangefinder (LD/R): traversing unit, tripod, and battery. It weighs approximately 51 lbs; with the LD/R and battery carried by one man and the tripod and traversing unit carried by another man. The GLLD fielding will begin in the early 1980's.

The *Copperhead* Development Program is managed by the Armament Research and Development Command (ARRADCOM) with the Laser Homing Seeker being developed for ARRADCOM by MICOM. It is a 155-mm, 54-in, 137-lb semi-active, laser-guided projectile. The guidance and control element detects laser designated reflected energy from the target and provides commands to fins which guide the projectile to the target. The fuze is armed after receiving a guidance signal and fires the warhead on target impact.

This projectile will be used in indirect fire from 155-mm howitzers to kill tanks and other vehicles. *Copperhead* will permit a large reduction in ammunition required and provide a very high kill probability. It will support combat operations in all types of terrain and climate in which the supported units may operate.


Photo 5

Copperhead was approved for production on November 6, 1979 and deliveries are scheduled to begin in about 12 months.

The HELLFIRE Modular Missile System is being developed as the antitank system for the Advanced Attack Helicopter (AAH). It is designed with a missile that will initially be deployed with a laser homing seeker. Because of its modularity, it will have a capability to adapt to other technology innovations as they come along. It will be mounted on a modular launcher using two or four rails (an AAH can carry up to 16 missiles). The missiles are capable of being fired individually or within seconds of each other, depending upon employment techniques. HELLFIRE on the AAH can home in on a laser spot using either the AAH designator (Target Acquisition and Designator System) or any other designator such as the GLLD. HELLFIRE offers significant improvements in speed, range, accuracy, and effectiveness.

In the current development program, operational testing was completed in the summer of 1980, and production is to begin in the fall of 1980. Other on-going application programs for the potential use of HELLFIRE are:

- The *Blackhawk* (demonstration in 1980).
- Air Force *A-10* close support aircraft.
- A study of the ground-launched application.
- Marine Corps *AH-1J/T.*
- An Army demonstration for use on the *AH-1S* (1981).

In addition to these carrier applications of HELLFIRE, a second generation seeker is planned for a development program start in the fall of 1980.

Stinger is a shoulder-fired air defense missile that operates on infrared guidance. Its mission is to provide low-altitude air defense for forward area combat and combat support units and is intended as the eventual replacement for *Redeye.* It also has an interrogator that will help to identify friendly aircraft to the gunner.

The weapon consists of a round, disposable launch tube, and reserviceable "identify friend or foe" interrogator, grip stock, and battery coolant unit.

Production deliveries began in the spring of 1980. An improved capability, *Stinger Post,* now in development is an enhancement program to give the seeker greater capability against enemy countermeasures. The current planning is to phase it into production in the mid-1980's.

The Multiple Launch Rocket System (MLRS) is a weapon that will provide a high volume of firepower in a short time. It consists of a self-propelled launcher/loader that carries two launch pod containers. Each launch pod container holds six 230-mm rockets ready for firing. The rocket has a range of more than 30 km. The launcher/loader module is mounted on a special adaptation of the *M-2* Infantry Fighting Vehicle (IFV) chassis. It will traverse or elevate on the chassis and can fire the rockets singly or in ripples. The rockets will carry the M-42 antipersonnel/antiarmor submunition. Efforts are underway to develop a terminally-guided warhead and an antitank scatterable mine warhead. The MLRS is intended to deliver high concentrations of firepower against air defense, indirect fire support, personnel, and materiel targets primarily during surge conditions. It will be able to shoot and scoot; that is, fire, reload, and move to another location before the enemy can direct effective counterbattery fire against it.

MLRS takes on added significance as a major NATO weapon system since it is being developed together with the governments of France, the United Kingdom, and West Germany.

All validation phase testing has been successfully completed.

Emerging Systems Concepts

Emerging systems are demonstrations of the technology that

Photo 6

has come from basic laboratory research. Here the MICOM labs and (ASCO) evaluate the feasibility and practicality of proposed solutions to specific military needs. If these ideas appear ready for further development, they are normally placed into a feasibility demonstration program.

The U.S. Army Infantry has a present need to carry out assaults against bunkers in urban areas. Two concepts to conduct this mission are the Rifleman's Assault Weapon (RAW) and the Special Hard-Target Assault Weapon—Light antitank weapon system (SHAWL).

The RAW is a flat-trajectory, rocket-propelled grenade that can be launched from the standard infantry rifle. It is initiated by firing the *M-16* rifle which causes escaping gases to initiate a motor that spins the ball up to 60 rpm. It then separates to hit the hard target. It is expected to weigh about 6 lbs. Efforts are now ongoing to determine noise, recoil, warhead, and firing-from-enclosures effects. It is due to be demonstrated in 1980.

The SHAWL is a modification of *Viper* that provides a second warhead that functions as a hand grenade. As the rocket impacts the target, the front warhead detonates making a hole large enough for the second, an antipersonnel warhead, to follow through and detonate with a time delay fuze. This design was demonstrated in 1979 and will continue through 1980.

The Fiber Optics Guidance—Demonstration (FOG-D) is an effort to keep TOW and *Dragon* gunners from being exposed to enemy direct fire weapons by firing missiles over-the-hill and out of line-of-sight. Using fiber optics from commerical communications systems, wound on a spool like that used in TOW/Dragon, the image is processed back to the launcher and the operator. When the operator selects the desired target, the autotracker is then locked on and automatically homes on until impact. The FOG-D will be flight tested in 1980.

The *Stinger,* when employed as a multipurpose lightweight missile, appears to fill the need for the Army to provide a self-defense capability for attack helicopters. In June 1976, two *Stingers* were fired from an *AH-1G* helicopter and scored kills against a drone. Tests were conducted again in 1978 and 1979 to determine the operational feasibility of the concept. They conclusively demonstrated *Stinger* to be a valuable self-defense weapon for the helicopter.

Assault Breaker is one of the newer generations of smart missiles that incorporates Terminally-Guided Submissiles (TGSM). This is a term applied to a generic category of homing missiles which are delivered in numbers by a single carrier, but dispersed so that multiple targets can be directly intercepted, hence increasing military effectiveness. Defense planners have been interested in the need for a "force multiplier" to counter expected Eastern Bloc numerical superiority, especially in armored vehicles such as self-propelled artillery, tanks, and personnel carriers. The advent of TGSM now provides an in-depth capability to destroy armor by indirect fire using artillery, rocket, missile, or aircraft delivered submissiles. There are applications to several weapons concepts using different methods of accomplishing the delivery, dispersal, guidance, and homing. The infrared seeker had a successful demonstration program in 1979, and a milimeter wave system is to be demonstrated in 1980.

There are tremendous capabilities that are already in the hands of the troops, or will be shortly. These programs are by no means all that goes on at the Missile Command. However, it shows that a dedicated team of military and civilians are doing to give the U.S. Army qualitative and quantitative advantages over any enemy—an undertaking that heeds the words of General Douglas MacArthur regarding preparedness.

"Armies and Navies, in being efficient, give weight to the peaceful words of statemen, but a feverish effort to create them once a crisis is imminent simply provokes attack."

The Missile Command is dedicated to insuring the efficiency of our Army today and tomorrow.

Photo Credits

Photo 1 on page 44 is of a 4 x 8 foot oil painting by Albert Lane, a staff artist with the U.S. Army Missile Laboratory, MICOM. Mr. Lane previously served as an artist with the National Aeronautic and Space Agency and the Space and Air Museum of the Smithsonian Institute. The painting hangs in the office of the Deputy Commanding Geneal, MICOM. Other photos in the article are of: 2) *Stinger,* 3) TOW, 4) *Viper,* 5) *Dragon,* and 6) *AH-64* firing a HELLFIRE.

BRIGADIER GENERAL BENJAMIN J. PELLEGRINI is the Deputy Commanding General for Research and Development, U.S. Army Missile Command. He was commissioned in Air Defense Artillery upon graduation from the United States Military Academy in 1958. His recent assignments include: Military Assistant to the Secretary of the Army, 1975-1976; Project Manager, GLLD, 1977-1979; and Project manager, HELLFIRE/GLLD, 1979. He holds MS and Ph.D Degrees in Nuclear Physics from Tulane University.

MAJOR JIM McCULLOUGH was commissioned in Infantry upon graduation from USMA in 1969. He has served with the 8th Inf Div (Mech) in Germany, 1st Cav Div in Vietnam, and the 82d Abn Div. He commanded Infantry units in the 1st Cav and 82d Abn. He holds an MS in Contract Administration from Florida Institute of Technology. From 1977 to 1979, he was in the HELLFIRE Project Office and is currently the Executive Officer to the Deputy Commanding General for Research and Development, U.S. Army Missile Command.

Recognition Quiz

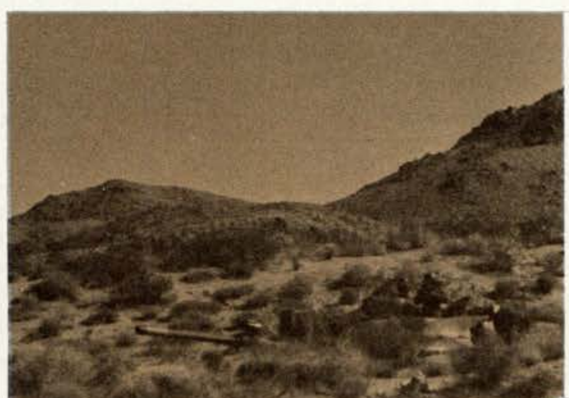
This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

(Answers on page 60)

1

2

3



4

5

6

PROFESSIONAL THOUGHTS

Do We Need a Light Tank?

The U.S. Army Training and Doctrine Command (TRADOC) is studying a requirement for an Air-Transportable, Protected, Antiarmor/Assault-Capable System (APAS) to augment the firepower of light divisions currently being designed for the 1986 timeframe.

The light tank is not a new innovation. Vehicles of this type have been in the field in one form or another since World War I. Periodically, articles appear in military journals expounding the virtues of the light tank. However, in the next issue of the same journal, an equally emotional letter to the editor will appear, pointing out the historically poor combat effectiveness of such a vehicle. So why is TRADOC studying this issue now? Some of the reasons are:

- The requirement to design what the Army Chief of Staff refers to as "medium forces." These are forces that can be moved quickly, yet maintain their ability to destroy enemy tank forces. To meet this need it appears that we need a tank killer that will fit inside our most numerous air carrier, the *C-141.*
- The technological growth in armor protection and mobility has made our present light infantry antiarmor weapon system, the *M-151*-mounted TOW, obsolete. Improvements planned for the TOW and the replacement of the *M-151* with the High-Mobility, Multipurpose Wheeled Vehicle (HMMWV) will offset this technology somewhat. However, in an artillery-rich environment these very lightly-armored, wheeled vehicles will not be effective offensive/assault weapon systems.

Technological growth has two other major impacts: cost and complexity. There is a very real chance that we will win the technological battle, but lose the next war because we can't afford to field enough high-technology weapons systems to overcome a numerically superior Threat. Our increasingly complex weapons systems require engineers to design a vehicle that is simple to operate by making it more dependent on high technology. It is nice to enable a driver to check the engine's oil level from a panel located in the driver's compartment. But, in our effort to make the vehicle easier to operate, we've added another electrical gadget that adds cost and a potential repair job.

Another problem is: Who's going to make the repair? At the organizational level, mechanics replace black boxes—a task that is within their current capability. The important question is: Who repairs the black boxes? Unfortunately the answer is a highly skilled electronic repairman, who is neither recruited nor retained easily.

In light of this technological dichotomy, is the solution for fielding an APAS a light tank? Probably so, if it has the following characteristics:

- Meets weight and size constraints to permit two vehicles to be strategically deployed in a *C-141.*
- Mounts a main gun that is capable of firing a kinetic energy round that will defeat a *T-80,* and machineguns that provide antipersonnel and enemy air protection. A kinetic energy round is specified to keep the fire control uncomplicated, permit the use of a simple automatic loader, and reduce overall weight and size of the vehicle.
- Possess simple fire control, consisting of a thermal sight and a backup telescope. The sight should have a choke reticle that will allow the gunner to determine quickly if the target is within battlesight range. Given a hypervelocity round, all enagements will be battlesight out to roughly 2,500 meters, thus eliminating the need for rangefinders, ballistic drives, computers, etc.
- Possesses high mobility and agility to offset the lightness of armor caused by weight constraints. The suspension system of torsion bars and rotary shock absorbers must be simple and rugged, with high wheel travel. Exotic hydraulic suspensions must be avoided. The powerplant must be a conventional diesel engine with high horsepower and the lowest possible fuel consumption. (Large fuel tanks equal large vehicles.) If the power pack can be common to fielded systems (i.e., the IFV/CFV), so much the better.
- Provides armor protection sufficient to allow the crew to survive 152-mm shell fragments and 14.5-mm armor piercing rounds.

Neither engineering time nor money should be spent to give this vehicle a swimming capability; air drop capability; or a hunter-killer sight, television cameras, or other "exotic fire control;" hydropneumatic suspension, or TOW firing capability.

In short, *Keep it simple!*

In the development of any combat system there are tradeoffs. For example, a vehicle may get 2 extra cross-country miles per hour with a more advanced, yet more vulnerable, suspension. When such tradeoffs come up, the decision makers must support reliability, ruggedness, and simplicity—not marginal performance increases. Our engineers will design the vehicle to be capable of military operations on extra-terrestrial bodies if we let them. By keeping it simple, we will not only be able to crew and maintain it but also afford it. We must also realize that this vehicle will not do all things. It cannot replace the *XM-1* or the HMMWV, nor can it be a scout or command vehicle. It can provide the light divisions a deployable limited antiarmor assault capability. There is little doubt that there is a requirement for an antiarmor assault vehicle for Army and Marine rapid deployment forces. Medium tank battalions simply are not transportable or supportable by "medium" forces. A light tank designed for ease of operation, maintenance, and survivability can be an effective offensive antiarmor weapon system for our rapid deployment forces.

How long will it take to field such a vehicle? If we use as many common tracked vehicle components as possible (i.e., IFV suspension, roadwheels, powerpacks etc.), use single source procurement, keep it simple, and get started *today,* we could possibly have it in 1986.

RICHARD P. GEIER
Captain, Infantry

Light Armored Corps

"Armor is a concept. It is not a tank or a specific weapon system, but rather a state of mind—an approach to combat that stresses firepower, mobility, shock effect."

This statement has been heard by every Armor lieutenant in one of his first lectures at the Armor Officer Basic Course. We in the Armor community, however, have not always been as mentally mobile as our vehicles and have sometimes been slow in embracing new concepts. Such an opportunity for innovative thinking has been postulated in a recent article in *Armed Forces Journal International* (Jan 80) by Lieutenant General James F. Hollingsworth and Major General Allen T. Wood entitled "The Light Armored Corps—A Strategic Necessity."

The article calls for a rapid deployment force that is built around a light, air-transportable tank. The corps could consist of an airborne division, a light armored division, two Marine divisions and an armored cavalry regiment. The goal would be a force that could be deployed within 1 week.

Such a force is a necessity if substantial portions of our total forces are to be able to meet either the Soviet Threat or a Soviet-equipped Threat outside of Europe. The basis of this force would be a light tank that could be carried in a *C-130* (two per *C-141* or six per *C-5A*). This would allow a maximum deployment of over 1,300 tanks versus the 70 main battle tanks that it is possible to deploy at this time.

The lack of this capability is only too apparent to those who have participated in the Contingency Force Planning block of instruction at the Command and General Staff College. When faced with a Middle East situation against an enemy with Soviet equipment, the student initially looks into structuring a force with heavy concentrations of tank and mechanized units. However, the lack of strategic airlift and the time required for surface movement dictate that the student use airborne, airmobile, and dismounted infantry in order to accomplish a rapid build up. The mobility of forces once placed on the ground is totally dependent on what Army aviation assets are available.

The approach to creating a Light Armored Corps should be dictated by speed and the "art of the possible." Speed must encompass not only the swiftness in reaction that is the objective of such a program but also speed in traversing the materiel acquisition process. Presently, the Marine Corps has a requirement for a Mobile Protected Weapons System that specifies a 14-ton, helicopter-transportable vehicle. While Army thinking to this point has tended toward a heavier vehicle, our parochial view should not slow development or endanger the strategic mobility advantages that are offered by a lighter vehicle.

With respect to the "art of the possible," light tanks in the past have been ineffective due either to lack of firepower or oversophistication. Present technology allows defeat of Threat armor using a high length-over-diameter penetrator in a telescoping round. This is the essence of the ARES 75-mm gun being used in the Armored Combat Vehicle Technology (ACVT) Program. While ACVT concentrates on the 75-mm gun, a similar gun in 90-mm would provide increased penetration albeit at an increased weight. Automotively, the vehicle should concentrate on proven winners: diesel engine; simplified track and suspension; and of paramount importance, a common vehicle for the Army and Marine Corps. Failure to do so, in addition to the already mentioned disadvantages of strategic mobility and development time, would present interoperability problems between two services that would almost certainly be employed together.

As General Hollingsworth points out, a Light Armored Corps or a light tank is not a panacea but rather is a complement to our present capability that would allow us to protect our interests in locations other than Europe. This flexibility could be used in the Middle East, for rapid reinforcement of Korea, or for assistance in this hemisphere. Current events are a daily reminder of this need.

We in Armor and the Army should not look at this concept as a threat to the main battle tank but rather as a new means to better meet wouldwide challenges. We in the Armor community should wholeheartedly support the concept of a Light Armored Corps.

D. W. McCLELLAN
Major, Armor

Battlefield Maintenance

A contributing factor to success on the playing field is staying power, which requires endurance and stamina from the starters and a bench with depth to replace any key losses due to injury or exhaustion. For example, if the star quarterback or linebacker is hauled off the field without a competent replacement on the bench, the chances of going home a winner aren't good. Unfortunately, such is the plight of our armored forces today. Our bench lacks depth.

In the past decade, the Army senior leadership has modified the principles of war, readdressed national strategies, and refurbished old techniques for defeating large armored offensives. In doing so, austerity of personnel, equipment, and material tempered the decisionmaking processes. The doctrine promulgated in FM 100-5 represents the fruit of that dedicated labor. It is our doctrine of war, the techniques and tactics, tailored to defeat the mass and preponderance of the Soviet Armed Forces.

Pragmatically speaking, the Army's present production base

for combat vehicles is modest at best and equipment reserves are not substantial. Our best-guess estimates of future armor-dominated battle predict prolific attrition of combat vehicles from mechanical and battle damage, which could be potentially devastating, particularly so considering our inability to replace combat vehicle losses one-for-one. Maintenance and repair of our existing battle equipment has become the only practical means at our immediate disposal to achieve staying power on the battlefield. Undoubtedly, staying power has evolved to become a prerequisite to our success.

The doctrine outlined in Chapter 12 of FM 100-5 details maintenance and repair techniques required to support the way we fight. However, and I say this reluctantly, professional logisticians have failed to implement the doctrine in this inter-war training environment. I contend that without active practice of this doctrine, our first battle will be disastrous. It is time to practice what we preach--*battlefield maintenance.*

"Few forward support companies actually unload their entire authorized stockage allowance regularly and perform their maintenance mission in the field in support of maneuver units."

To develop support to such an obstinate opinion of our present maintenance system, I diverge briefly to history to clarify my concern.

Some 10 years ago, a distinguished American armored fighting force waged battle which possessed many of the combat characteristics of the active defense as we envision it. The location was the Vietnam-Cambodia border circa 1969-1970. The 11th Armored Cavalry Regiment, commanded by Colonel Donn A. Starry, was conducting operations along and across the Cambodian border in an effort to cripple North Vietnamese personnel and logistical support of combat operations in South Vietnam.[1] To achieve success, the Blackhorse Regiment practiced a method of operation nicknamed "pile-on" by the troops. It was a practical development involving rapid reinforcement of a unit. Once the enemy was located and engagd by a troop, reinforcements were immediately dispatched to the unit, thereby concentrating firepower and force at the critical time and place. This rapid reinforcement usually required swift movement over long distances.[2] Sound familiar? It should. It is the backbone principle of the active defense. When the dust had settled, the "pile-on" technique proved to be remarkably successful. The success was achieved despite the maintenance and repair system supporting the regiment. In his recent book, *Mounted Combat in Vietnam,* General Donn A. Starry explained:

> "Most armored units found the U.S. Army supply and maintenance system in Vietnam to be less than satisfactory at every level....In many cases the few support units that were available were centralized in areas far from the combat units. The obvious solution to the problem, the use of teams authorized to make major repairs at a unit's location, however popular with units was not popular with logisticians. Thus, combat units were frequently forced to send damaged vehicles great distances for repair....The resulting loss in combat power and the drain on the meager evacuation resources of the combat units was a severe hardship....Logistical units, particularly supply and maintenance elements were unprepared psychologically and in practice to live in the field close to the units they supported. Although Army doctrine stressed that this support should be provided in forward areas, the practice was to centralize support facilities in built-up, well-developed, permanent base camps, similar to installations in the United States....The regiment was obliged to live off its battle losses by cannibalizing disabled vehicles; the supply system provided only half the regiment's needs, cannibalization the rest."[3]

Now, I ask you. How far have we come towards developing a maintenance support system truly responsive to mobile, dynamic, armored warfare? If anything, increased centralization has become our maintenance hallmark with the rapid conversion to computer-based logistical management and trends towards consolidation of maintenance resources. Combat battalions still deliver damaged or disabled equipment to direct support facilities far from the line with hands full of paper and signatures. Few forward support companies actually unload their entire authorized stockage allowance regularly and perform their maintenance mission in the field in support of maneuver units. Seldom do you see direct support contact teams in battalion motor pools or collection points offering every repair resource available.

No matter how discomforting, Army logistical managers need to face up to some disconcerting facts. Our maintenance system is anchored in garrison tied to fragile computers, maintenance personnel are not trained to put disabled vehicles back into the fight with a sense of urgency, and we do not practice combat vehicle repair regularly under field conditions at direct and general support level. This *modus operandi* will deadline a division within hours of the initial meeting engagement when time becomes the dominating influence of battle results.

What we must do is insure responsiveness of the maintenance and repair system to the need of the combat company commander. He and his soldiers will be determining the outcome of the battle as they have in every war in history. What type of system should it be? Recent history has the answer. Compare and contrast the following anecdote with our present repair methods. The implications should be clear, alarming, and spark professional concern.

During the battle for the Golan Heights in October of 1973, Israeli and Syrian armored brigades clashed and sustained combat vehicle losses unparalleled in history. It was our first glimpse of what future armor-dominated battlefields hold in store for us. Colonel Moshe Harel, an armor battalion commander in Seventh Brigade, Israeli Defense Forces, described the maintenance support requirements of those fast, deadly battles and the repair methods used by his soldiers to keep combat force in the fight:

> "... technical teams likewise operating alongside the tanks, at times under direct fire and artillery bombardment. They were forced to protect themselves while simultaneously working. Of the 250 tanks hit during the course of fighting, approximately 100 were disabled while the rest were repaired on the spot...often several times."[4]

[1] General Donn A. Starry, *Mounted Combat in Vietnam,* Vietnam Studies, Department of the Army, Washington, D.C., 1978, p. 139-165.
[2] Ibid., p, 145.
[3] Ibid., pp. 181-182, 184.
[4] Colonel Moshe Harel, *The Battle for the Golan Heights,* a lecture translated by Captain Dr. Yehuda Weinraub, IDF Spokeman's Unit Information Branch, printed in Historical Readings, a publication of the U.S. Army Armor School, Fort Knox, Kentucky, May 1979.

Interesting isn't it? Whether or not we should adopt similar practices can be argued. However, it must surely be our best representation of what our next battle will require to achieve victory or enhance our chances.

I close with a prophetic remark made recently by General Starry:

> "In view of the renewed emphasis on mobile warfare and the heavy odds that armored forces face, a much more responsive supply and maintenance system is a necessity. Forward location of maintenance units, forward support, mobile repair teams, and quick resupply from accurate inventories must become as routine for combat service support units as the use of combined arms for armored units."[5]

With any luck, we won't be called to the battlefield tomorrow, but if we are, battlefield maintenance will be a prerequisite to our success and survival

JOHN D. ROSENBERGER
Captain, Armor
11th Armored Cavalry Regiment

[5] General Donn A. Starry, *Mounted Combat in Vietnam*, Vietnam Studies, Department of the Army, Washington, D.C., 1978, p. 185-186.

Needed—A New Command Post Vehicle

In order to survive on the modern battlefield, each battalion, brigade, and division command post (CP) must be able to displace rapidly and repeatedly without interrupting the command and control of the line units. Movement of the CP will be necessary both to keep up with rapidly moving units and to outrun its own distinctive signature. Presently, most CPs are unwieldly and rely on a tactical (TAC) CP or "Jump TOC" to provide continuity during each move. If required to move every 4 hours, most CPs never would be fully operational, yet that is probably the maximum safe stay for a battalion CP, even if not subjected to intense electronic warfare.

One reason for the immobility of our present command posts is the variety of vehicles and equipment assembled there. Most of this equipment was never designed to meet the needs of a mobile CP. The closest thing to a dedicated command post vehicle now in use is the *M-577,* a raised-roof version of the *M-113* armored personnel carrier. This vehicle performs marginally in the CP role. Its distinctive silhouette is readily identified, labeling it as a high priority target once spotted anywhere in the combat zone.

Although well enough armored for its mission; it is unarmed, lacking even the *M-2* .50 caliber machinegun common to most other "tactical" vehicles. The *M-577* is nominally amphibious, but will only float if perfectly loaded for correct trim in the water. The interior layout was inherited directly from the *M-113* and is unsuited to the role as a mobile office.

The present Army inventory does include a suitable chassis upon which to build a true mobile command post vehicle: The *M-548*! By combining some 40-year-old ideas with modern technology, a new CP track could enter the inventory within 2 years with a full prescribed load list and authorized stockage list support, trained maintenance personnel, and proven equipment.

The idea of establishing a command post in a number of converted cargo trucks is not new. Both built-up fixed and expandable 2½-ton vans have been used over the years. These vehicles lacked the cross-country mobility and water-crossing capability that will be needed in a modern CP vehicle. They were also vulnerable to both small arms and artillery fire. The extensive Threat artillery capability combined with rapid radio direction finding make resistance to shell fragments necessary for a command post. This can be accomplished through the use of approximately 15 mm of armor for both the walls and roof of the CP track. Design of an armored, expandable rear section for the *M-548* should not be complicated; even when the amphibious capability must be retained.

Establishing a truly mobile CP would require the maximum possible standardization of CP vehicles and equipment. To meet this goal, while providing for the diverse needs of the various staff sections and the command element, the interior layout of the command post vehicle must be flexible and changeable. Establishment of a standardized modular interior system can fulfill these conflicting requirements. Such a modular system would be comparable to the standard 19-inch rack electronics mounting system which has permitted the development of many modular arrangements of various communications-electronics equipment. With standardized mounting points evenly spaced around the perimeter of the floor and wall any combination of required equipment could be installed rapidly, yet securely, to meet the changing needs of different CP elements. With a complete wiring harness connecting all communications equipment to a control box in the cab, all radio nets could remain in use (perhaps at reduced efficiency) even while the vehicle was in motion.

Using the *M-548* chassis retains the same degree of commonality that we now enjoy with the *M-577.* Our mechanics are already trained to maintain it and most parts that would be required for a CP track are already in the supply system. Since this chassis is the basis of several current and proposed vehicle systems, it can be expected to be with us for many years. While the *M-548* may not provide the ultimate CP track, it is capable of substantially improving the mobility and survivability of our battalion, brigade, and division CPs. Such a vehicle could be fielded in 1 to 2 years by making maximum use of proven components.

THOMAS CURRIE
Sergeant First Class
1st AIT/OSUT Brigade, Armor

BRIEFS FROM OTHER JOURNALS

The Integrated Battlefield—Two Similar Views

*In the March-April 1980 issue of **ARMOR,** Major General Thomas P. Lynch, former commander of the U.S. Army Armor Center, writing in the "Commander's Hatch," expressed his view of the modern battlefield and how we must prepare and train for it. In the February 1980 issue of the Soviet Military Review, Lieutenant General N. Neyolov, Deputy Commander for Military Education and Training, Moscow Military District, authored an article on the same subject. The similiarity of their views is very striking. Neither had prior access to the other's thoughts, which is particularly significant in that they could have been potential adversaries.*

Both articles stress the importance of speed and innovation. This is particularly significant for two reasons; first, as the U.S. Army enters a period of modernization in the eighties, our leadership must face up to and exploit with openmindedness the employment speed capabilities of the Abrams tank and its fighting vehicle companions. The Soviets have recognized the significance of speed and it is a prominent consideration in their doctrine and equipment development. Second, we have had a tendency to conclude that Soviet unit-level leadership is in lock step and lack of innovation on their part is a characteristic weakness. The tone of the Soviet article and other Soviet doctrinal writing do not support this assumption.

Another striking feature of both articles is that they express a philosophy consistent with the current edition of the U.S. Army's FM 100-5, "Operations."

Speed and innovation are two qualities that contribute to the synergistic effects of combined arms employment. Approaching doctrine and tactics with World War II notions of what employment speed ought to be just won't fit the environment of today's and tomorrow's integrated battlefield.

Finally, logisticians should take special note of the depth of penetration and nonlinear battlefield characteristics that General Lynch and the Soviet writer emphasize. Logisticians must also understand speed and innovation and be prepared to defend themselves and consider the critical question of whether our present layered logistics organization is capable of meeting the demands of the battlefields upon which we may have to fight.

JOHN H. KIRKWOOD
Colonel, Armor
Director of Armor Doctrine
USAARMC & Fort Knox

A battle is an organized armed encounter of formations, units and subunits of the belligerent sides with a purpose of destroying, defeating, or capturing the enemy and also of seizing and holding important areas.

Victory is achieved by powerful blows by all types of weapons, timely exploitation of their results, and vigorous and resolute actions of formations, units, and subunits.

The advent of nuclear weapons, provision of forces with great numbers of tanks, infantry fighting vehicles, guns, antiaircraft weapons, aircraft, helicopters and other combat equipment and armament have led to profound changes in the character and methods of combat actions of subunits, units and formations, and imparted to modern battle a number of features radically distinguishing it from fighting in the past. It is characterised by high maneuverability, intensity and fluidity, and by rapid and sharp changes in the situation. Combat actions spread over a wide frontage, to a great depth and are carried out at high speed.

One of the characteristic features of contemporary battle is the resoluteness in achieving the aim. It is manifested in all types of combat actions and is determined by two main causes: by the political purposes of the war and the use in it of exceptionally powerful means of destruction. This predetermines the noncompromising issue of war, i.e., the pursuit of hostilities to complete victory over the enemy.

Resoluteness finds its expression in one of the main principles of tactics—combat activity. Its essence consists in the fact that victory in battle, as a rule, is achieved by the side which, other conditions being equal, is more active, energetic, shows initiative, imposes its will on the enemy, and forces him to act in conditions disadvantageous for him.

Activity in battle presupposes the ability of commanders to take daring decisions and show persistence in carrying them out through the energetic and selfless actions of the forces, striving to win victory in the shortest possible time and with minimum losses. Activity demands flexible employment of different kinds of actions. But the most effective kind is the offensive. It is this type of action which ensures the defeat of the enemy.

Use of powerful weapons, high mobility of forces, absence of a continous front line, and presence of large gaps and open flanks make modern battle highly maneuverable. Nuclear weapons make it possible to deliver powerful blows at short notice, to put out of action a great quantity of enemy manpower and equipment, to make considerable breaches in his battle formations, and to create the necessary conditions for a

rapid advance of one's own forces. The growing combat possibilities of the troops and their high mobility allow the results of nuclear and fire blows to be quickly exploited. The enemy can be attacked from on the move and the effort intensified in a short time in those directions on which the greatest success has been achieved.

Considerable dispersion of units and formations creates favorable conditions for carrying out enveloping movements, deep turning movements, daring approaches to the enemy flanks and rear, and for striking unexpected and resolute blows at the enemy from various directions.

Maneuver is an integral part of contemporary battle. It can be carried out with manpower and equipment, nuclear blows, and fire of conventional weapons.

A fire maneuver can be carried out in an exceptionally short period of time and to a great depth. It can inflict on the enemy such losses of manpower and equipment that it is not necessary to create large groupings of forces for delivering a blow.

The importance of maneuver with forces has also grown. Its scale, conditions, and purposes have substantially broadened. Maneuver with forces is carried out for the purpose of holding an advantageous position to deliver a blow at the enemy's most vulnerable spot.

A well-thought-out and successfully carried out maneuver has always been considered a sign of a commander's high combat skill.

The employment of methods of fighting unknown to the enemy, and of new weapons, powerful fire blows and high mobility of forces, combat actions carried out through the entire depth of battle orders of units and formations, including second echelons and reserves, make a modern all-arms battle fluid and tense.

Owing to the capacity of the nuclear weapon to change almost instantly the correlation of manpower and equipment in a given direction and the increased combat capabilities of forces, the situation on the battlefield may change in an extremely short time. And in some cases, the change may be very sharp. All this makes battle highly dynamic and fluid. Consequently, the necessity for combat readiness is enhanced because on its level depends the speed and organization with which units and subunits are committed to battle and their success in fulfilling their combat mission. (Emphasis added. Ed.) In this connection, the time factor and operational efficiency of the work of commanders and staffs are of particular importance. In as much as the time for organizing battle is reduced, the commanders seek methods of organizing it which demand less time. For this purpose, the methods of formulating decisions and bringing them knowledge of subunits and units are being improved and the new technical means of control introduced.

Here much depends on the initiative, resource, and creative ability of commanders. A creative approach to the solution of problems at exercises, for example, helped one battalion commander to win time and thus achieve success in a practice battle. In a meeting engagement, he deployed subunits into battle order straight from the battle columns, bypassing the classical successive reorganization first into company and then into platoon columns. The battalion forestalled the "enemy" in deployment and was the first to deliver a blow. It goes without saying that such a method is far from being always practicable. But in the given situation it proved its value.

"The great depth of all-arms battle is conditioned by the increased range of modern weapons, the wide use of airborne troops, and the ability of forces to penetrate quickly into enemy positions."

The considerable increase in the combat capabilities of forces, their maneuverability, air mobility, and ability to overcome vast distances and water barriers without stopping result in combat actions spreading out over a wide frontage to a great depth and being carried out at high speed. The great depth of all-arms battle is conditioned by the increased range of modern weapons, the wide use of airborne troops, and the ability of forces to penetrate quickly into the depth of the enemy positions.

If, for example, during the Great Patriotic War, a battalion carried out an offensive on a frontage up to 0.5 km; today it is up to 2 km. The speed of the offensive has grown, too, and maneuverability increased.

As a rule, combat actions develop unevenly; in certain directions units can advance rapidly, in another success may turn out to be insignificant, and in yet another the troops may be forced to hold defenses or even withdraw. Mutual deep penetration of the belligerents is a usual occurrence. Frequently, subunits and units are forced to fight battles with the flanks exposed and with outflanked enemy forces in their rear capable of carrying out effective actions.

"Modern all-arms battle makes new, higher demands on the combat skill, discipline, moral, psychological steeling, and physical training of personnel."

Modern all-arms battle makes new, higher demands on the combat skill, discipline, morale, psychological steeling, and physical training of personnel. Particularly, high demands are made on commanders. They must be able to understand the situation which has taken shape, to make a correct decision, be firm in carrying it out, and display poise and initiative. Even when their units sustain heavy losses in manpower and equipment, commanders must be firmly resolved to carry out the mission at any cost.

Recently, science and technology have been developing at high rates. Ever new models of weaponry are coming into military service in all armies the world over. The character and features of modern battle are changing accordingly. This demands a creative approach to the study of the theory of battle, competent application of the theoretical principles to practice, the search for new forms and methods of carrying out operations.

Condensed from an article by Lieutenant General N. Neyolov in the February 1980 issue of Soviet Military Review. Reprinted by permission.

NOTES

Sabers Presented

U.S. Armor Association sabers were presented to two cadets of the class of 1980 who distinguished themselves, one as the deputy brigade commander of the Corps of Cadets, and the other as the highest academically-ranked cadet selecting armor.

The presentations of the "Conqueror" sabers were made during ceremonies at the United States Military Academy on 28 May 1980. Colonel Robert G. Moscatelli, (center) tactical officer for the 1st Regiment of the Corps of Cadets, officiated on behalf of the Armor community at West Point and the U.S. Armor Association.

Second Lieutenant John K. Stoner, III (left), as deputy commander of the brigade, was the second senior man in the Corps of Cadets. Before commissioning, he served with 3-68 Armor in Germany, was captain of the varsity soccer team; became jump qualified, and served as the battalion commander for TCAT, the annual combined arms training conducted at the Armor Center at Fort Knox for some 1,200 sophomore cadets. Following AOBC, he'll attend the Motor Officer Course and be assigned to 1st Squadron, 1st Cavalry, 1st Armored Division.

Second Lieutenant David J. Speck (right) graduated 41st in his class. Prior to being a regimental staff officer this year, he served with the Berlin Brigade. As a cadet, he was a member of *Phi Kappa Phi* National Honor Society, a delegate to the Naval Academy's Foreign Affairs Conference, and was the recipient of the General George P. Stone Award for Excellence in Arabic Studies, and was a part of the foreign exchange program to Jordan. He will attend AOBC and the Junior Officer Maintenance Course before reporting to the 3d Armored Cavalry Regiment at Fort Bliss, Texas.

Armor Graduates, Class of 1980, USMA

On 28 May 1980, 105 graduating members of the Class of 1980 at the United States Military Academy were commissioned as second lieutenants of armor. Included among those opting for the combat arm of decision were the deputy brigade commander, five battalion commanders, four company commanders, the brigade color lieutenant and color sergeant, numerous regimental and battalion staff officers and platoon leaders.

Initial assignments see 49 going to FORSCOM units, 6 to TRADOC, 47 to USAREUR, and 3 going to Korea. Most of the group are heading for tank platoons, but over a quarter are going to cavalry units. Thirty-eight percent will attend the Junior Officer Maintenance Course, while 27 others will take Airborne training; 18 will attend the Mortar Platoon Leader's Course, and 3 the Improved TOW Vehicle Course.

Armor Leadership Award Winners

Company C, 1st Battalion, 66th Armor was awarded the Armor Leadership (Draper) Award, recognizing it as the best armor or cavalry unit in the 2d Armored Division. Captain James S. Ritter, the company commander, accepted the award.

Company C, 3d Battalion, 63d Armor received the award as the best armor or cavalry unit in the 3d Infantry Division. First Lieutenant Neil Youngberg, the present company commander accepted the award, who gave much of the credit to Captain Robert C. Allen, who was commander for a large part of 1979.

The purpose of the Armor Leadership Award is to promote and perpetuate leadership in armor and cavalry units.

Lucky 13 Association

The Lucky 13 Association, organized by the 2d and 11th ACRs, represents a fraternity of fighting men in USAREUR dedicated to improving training and combat techniques. Meetings of the Association will provide a forum in which discussion of these and other topics of vital operational concern to the cavalry community in Europe can take place.

The first meeting was held on 1-2 May 1980 at the headquarters of the 2d ACR in Nurnberg, FRG. Attending the meeting were representatives from the 2d and 11th ACRs, each of the divisional cavalry squadrons and separate cavalry troops currently serving in Europe.

The next meeting is scheduled for 13-14 November at the 11th ACR's headquarters at Fulda.

LTG (USA-Ret) Willis Dale Crittenberger, former President of the U.S. Armor Association (1950-1953), died on August 4, 1980. General Crittenberger was born on December 2, 1890, and graduated from the U.S. Military Academy in 1913 with a commission as a Second Lieutenant of Cavalry. During his more than 39 years of military service, he commanded every sized unit in the Army from a platoon to a theatre. In March 1944, he was named to command the IV Corps in the Italian Campaign, and he commanded the corps until the end of World War II. General Crittenberger was the Armor Association's Honorary President, and he had been an association member for 67 years.

Advanced Military History Research Program

The U.S. Army Military History Institute (MHI) sponsors an Advanced Research Program in military history as a means of stimulating research and study in the history of military affairs at the Army's major repository of materials.

Applicants must complete a form describing the subject, scope, and character of their project; the time estimated for residence at MHI; how MHI facilities, personnel, and materials will aid in their research project; and a careful estimate of expenses to be incurred. Awards will be made only to cover expenses while conducting research and writing at the institute.

Consideration will be given to each project's usefulness for MHI and the professional field of military history, as well as to the U.S. Army. Both military and civilian scholars are eligible to apply. Application forms can be obtained by writing to:

Director
U.S. Army Military History Institute
Carlisle Barracks, PA 17013

Completed applications must be returned by 1 January 1981.

First Ground Laser Target Designators

The first 17 production Laser Target Designators (LTD), hand-held devices that will enable ground troops to pinpoint targets for laser-homing weapons or mark them for the delivery of conventional weapons, have been delivered to the U.S. Army. The less than 16-pound designator, which resembles a short-barreled rifle, is the lightest ground designator in the world.

The LTD directs an invisible beam of laser pulses at any target the operator can see. The coded pulses are reflected from the target and can easily be detected by special sensors in aircraft or laser-homing missiles or projectiles.

Five of these production systems are going to the U.S. Air Force for follow-on testing and evaluation. Forward air controllers will use the LTDs in tests with *A-7* and *A-10* aircraft equipped with *Pave Penny* laser spot trackers.

Fire Control Testbed

Testing of a fire control test bed based on an *M-60* was recently completed by ARRADCOM at Picatinny Arsenal. The test bed will be used to measure changes in gunner manual tracking accuracy when using a direct view of the target through a periscope versus an indirect view through a TV monitor. Also to be tested will be a comparison of the standard gunner's yoke versus a new isometric thumb control, as well as additional electronic tracking aids fabricated during the test.

Data accumulated from these tests will be analyzed on gunner tracking accuracy, line-of-site rate, sight and weapon stabilization performance, vehicle-gunner disturbance environments, and the relative value of direct versus indirect tracking.

Army Testing Map Reader

An automatic map reader tracking system is currently undergoing evaluation by the U.S. Army Human Engineering Laboratory that will allow helicopter pilots to determine their location in a tactical situation in a single glance. The map reader is relatively small, can be handheld, and is portable. It is attached to a doppler navigation interface system and is capable of several modes of operation.

Operation of the reader is fairly simple. First the pilot positions the map inside the reader and sets the reader to grid north. Next, he slews the crosshairs to denote his exact position before takeoff. Then, in the present position mode, the reader will track the aircraft's position.

Ratel MICV

The *Ratel* mechanized infantry combat vehicle has been in service with the South African Defense Force since 1976. Additional details about it have recently been released. It was among the first MICVs to have a true commander's cupola, and a dual feed system for the turret-mounted 20-mm cannon.

The *Ratel* carries a crew of four, and six riflemen. Combat weight is 17 metric tons, while empty it is 15 metric tons. The engine is a 6-cylinder, in-line, water-cooled, turbo-charged diesel, driving a 6-speed automatic transmission. Either a 6 x 6 or 6 x 4 drive is selectable.

Coil springs and hydraulic shock absorbers are mounted on rigid axles, giving independent axle travel. Crosscountry 14.00 x 20 run-flat tires are fitted with armored wheel-covers.

Top speed is 105 km/h, while the safe road speed is 80 km/h. Crosscountry, the *Ratel* can make 50 km/h, and negotiate 70-percent slopes and 1.2-meter trenches. Ground clearance is 35 cm, and the maximum vertical drop is 2.83 meters. The main armament is a 20-mm cannon firing HE or AP with a dual-feed mechanism. The rate of fire is 700-750 rounds per minute, with the AP effective to 1,000 meters and the HE effective out to 2,000 meters.

Additional firepower is supplied by a 7.62-mm coaxial machinegun and another 7.62-mm gun used for antiaircraft. Smoke grenade launchers are mounted on each side of the turret, and a 60-mm mortar or an 88-mm rocket launcher is carried inside, in addition to the personal weapons of the crew and riflemen.

Details of the armor protection have not been released, but the driver is protected with armor-glass windows and armor flaps that can be swung down over the windows.

Entry to the vehicle is by two side doors, a rear door, and roof hatches that the riflemen can use to fire from the vehicle. There are also three vision blocks and three firing ports on each side for use by the riflemen.

This information was supplied by Helmoed-Romer Heitman.

OPMS-U.S. Army Reserve

Education Tips

USAR Officers may obtain an information packet and an enrollment application for a C&GS correspondence course by sumitting a request to:

USACGSC
ATTN: Registrar, ATZLSW-DECA-ET
Ft. Leavenworth, KS 66027

After receiving a packet, unit members should forward their application through command channels. IRR officers should forward their application through their PMO.

To obtain correspondence course catalogs, the following procedures should be followed: IRR officers request DA Pam 351-20 series for the specific branch in which they are interested from:

USATSC-IPD
ATTN: ATTASC-AI-PO (MAJ McGrann)
Ft. Eustis, VA 26304

TPU officers should direct their request for DA Form 351-20 through their training officer.

USAR officers enrolled in correspondence courses can communicate with the Institute for Professional Development (IPD) at Ft. Eustis, VA, by calling:

	AUTOVON	COMMERICAL
Infantry	**927-4776**	**(804) 878-4776**
Armor	**927-4571**	**(804) 878-4571**
Field Artillery	**927-4575**	**(804) 878-4575**
Air Defense	**927-4571**	**(804) 878-4571**

Duty hours are 0800-1745 (EST).

After duty hours call Code-a-Phone: AUTOVON 927-3085 or commerical (804) 878-3085.

Officers Must Report Changes

USAR officers are required to report changes in address, marital status, number of dependents, and civilian employment. Changes in physical or mental conditions that keep individuals from meeting standards must also be reported.

Selected Reserve Unit members should report changes in status to their unit administrative section or clerk.

Pretrained Individual Reservists, including all officers not in selected reserve units, report changes to:

Commander
RCPAC
ATTN: AGUZ-RMR
9400 Page Boulevard
St. Louis, MO 63132
When reporting changes in physical status, use ATTN: AGUZ-RCH

Other methods for reporting changes that are available to all USAR officers include the Postal Service mailing kit and DA Form 3725, "Army Reserve Status and Address Verification," which is mailed annually to each TPU member and twice each year to IRR members. All USAR officers may also call or write their personnel management officer (PMO). When writing, use the address above and the attention line **ATTN: AGUZ-OEC.**

Federal Emergency Management Agency (FEMA)

FEMA was created by Executive Order in July 1979. It is responsible for coordinating the disaster preparedness activities of a number of federal, state, and local agencies. As part of its ongoing effort to support the FEMA Program, the Department of the Army is assigning approximately 800 Mobilization Designees (nonunit Reserve Officers) to serve with state and local Civil Preparedness Offices.

Since participating officers must perform a minimum of 24 inactive duty for training (IDT) periods annually for retirement point credit, it is imperative that they reside within reasonable commuting distance of their duty station. Normally, recruitment for vacant positions is initiated at the local level and requests for by-name fills are forwarded to RCPAC for final screening by the PMO. In addition to 24 IDT periods, participants will also be afforded the opportunity to serve 12 days each year with their agency in an active duty for training (ADT) status. Assignments to Civil Preparedness Offices will normally be for a period of 4 years.

A Personal File

PMOs receive many calls requesting copies of documents in the Official Military Personnel File (OMPF). The main items requested are appointment letters, oath of office, DD Form 214, and course completion certificates. In order to get these items for either a TPU or IRR officer, the PMO must request the OMPF then send it to the Personnel Services Directorate which has authority to release items from personnel records to the individual. This all takes time, but there is another way. Officers should consider starting their own personal file. Items to be maintained in addition to the above are: pay vouchers, Leave and Earnings Statements, promotion letters, retirement points records, and officer evaluation reports. This "file" could prevent the delay in a promotion or aid in the selection process for service schools. In addition it will provide you backup documentation for creditable retirement years. The "system" works most of the time but your "file" will work all of the time.

Note: Officers should not flood the system with requests, but firmly resolve to start assembling a file on an as-you-go basis looking towards the future.

BOOKS

ANNUAL OF POWER AND CONFLICT, 1978-1979, A SURVEY OF POLITICAL VIOLENCE AND INTERNATIONAL INFLUENCE. Edited by Brian Crozier. The Institute for the Study of Conflict, London. 502 pages, 1979. $22.50

This is a most remarkable book. Above all it fills a void in international security affairs literature on power balances in every major nation of the world.

In the introductory remarks on superpower relations, Mr. Crozier writes a hard hitting condemnation of our "suicidal relations with Moscow." President Carter is found particularly culpable as "appeasement reigns in Washington as well as in London...the Carter administration has indeed proved itself indecisive as well as passive...making gratuitous and unilateral concessions to the Soviets." The remainder of the book is more evenhanded.

Decriptions of governmental activities and power struggles are provided for Western Europe, the Middle East, the Americas, and the Far East. They all provide information on internal problems. Terrorist developments are emphasized, and a chronology of events for each nation appears at the end of each country write-up. One such interesting piece notes that cooperation against terrorism has developed between some communist nations and free world states. The trend breaks down, however, when the reader discovers that Yugoslavia released four captured West German terrorists in a pique with the Bonn government.

The section on the Soviet Union's internal problems is succinct and informative. To wit: Critical indicies of economic well being looked terrible. The newspaper *Trud* (Work) reported that the city of Kemerovo (500,000 population) had run out of light bulbs; other reports stated that Moscow's only department store, GUM, was suffering from a surplus of shoddy materials no one wanted to buy. Moreover, the census of January 1979 confirmed the regime's fears that the Russians no longer form the majority of the Soviet population. Police crackdowns multiplied and self-published, clandestine literature increased. The Organization for Latvia's Independence called for a referendum on secession from the USSR, while a figure approaching 200.000 Soviet jews, out of a one-time population of 2 millions, have been permitted to emigrate.

The accompanying articles on Eastern European nations are uniformly incisive and professionally written. Internal struggles haunt each satellite. The monograph on Poland begins "The authority of the government continued to decline. Commensurately, the number of autonomous, non-official pressure groups increased.... "The "church's challenge" gets especial treatment. Yugoslavia's problems of both succession and the myriad separatist groups are highlighted, along with a growing, Muslim, religious threat to state authority.

Similar write-ups on the Western Hemisphere, and the section on the internal political stress of the U.S. specifically, are quite good. The information on U.S problems provides a perspective few Americans can otherwise find. It is both benign and powerful. The authors describe the growing strength of right-wing extremism, the antinuclear campaign, and the weakening of the U.S. intelligence community. The chronology of events has a sense of unreality about it. An example is this notation of July 12, 1978: "The 110th bomb credited to the FALN (a Castroite group) apparently went off in (the) maker's hands, blowing off both hands and face parts."

The factual, detached reporting on the U.S. political violence scene will bring a surprise or two to some readers, which makes the volume useful alone. Much more, however, the Crozier book will have utility to anyone interested in power relations.

ARTHUR W. McMASTER
Newport News, VA.

TEARS OF GLORY: THE HEROES OF VERCORS, 1944: THE CLIMATIC BATTLE OF THE FRENCH RESISTANCE by Michael Pearson. Maps by Rafael Palacios. Doubleday & Company, Inc., Garden City, N.Y. 1979. ISBM: 0-385-11446-X. 22x15 cm. 337 pages. Bibliography, index, 26 photos, 6 maps. Hardcover. $10.95

A recognized British author has directed his journalistic talents into writing a vivid and colorful recreation of the events which resulted in the distruction of 4,000 poorly armed French partisans during the summer of 1944. Mr. Pearson relies on a vast number of primary and secondary sources which he has analyzed and translated. The author concludes that the Free French government in Algiers and General de Gaulle were responsible for this tragedy.

In response to orders announcing the opening of Operation Montagnards, a force of 4,000 partisans was assembled on an isolated plateau near Grenoble in June 1944. Their mission was to disrupt the German communications and supply lines and prevent them from moving reinforcements to the southern invasion area when the invasion (Operation ANVIL) occured. These 4,000 men were to operate out of their Vercors plateau fortress, construct an airstrip, and prepare for the arrival of Free French airborne forces. The plateau would therefore become an impregnable Free French "colony" in the rear of the German Wehrmacht. The plan was simple, militarily sound, and very dangerous. For the mobilization of the Vercors, the blocking of the access roads and passes and the calling-up of men waiting in the towns on the plain was a very different decision to that of the execution of traditional resistance operations such as swooping attacks on rail yards or trucks. There could be no disappearing from the Vercors plateau. Once it was mobilized it would be there, defiant, immobile, a great citadel inviting German counterattack and reprisals. Once Vercors was mobilized the invasion of southern France must be imminent.

The mobilization came 6 weeks too soon, and the Resistance was forced to defend itself against 20,000 German and Axis troops, a large portion of whom were French *Milice*. Despite numerous pleas to Algiers and London, the plight of the Vercors defenders went unheeded. General de Gaulle had made an uneasy deal with the communists, who were strong in the French underground, in return for representation in his provisional cabinet in Algiers. The communists had agreed to cooperate with the General in fighting their common enemy, but already the conflict had started over who was to rule France after the liberation, the leftist parties or the Gaullists. So a site was selected for a force of French paratroops to drop in the middle of France. With a base in the Massif Central, de Gaulle would be well placed geographically to extend his influence throughout the country, to insure that the Gaullists liberated as many towns as possible, or to be close at least on the heels of the Allied troops who did.

The planes and paratroops allocated for this operation were the very ones promised to the Vercors. For six weeks Vercors cried for help, but their pleas fell on deaf ears. London insisted Vercors was Algiers' responsiblity and Algiers was commanded by de Gaulle.

The Vercors defenders were destroyed; those few who survived fled in small groups into the forests and caves. Relief came only with the Allied capture of Grenoble on August 22.

Pearson recounts all the action and drama of men at war with special emphasis on the Vercors leaders and their innumerable problems. The most notable issue faced by the military leaders was their attempt at assimilating the different resistance groups into effective military organizations. Many of the *Maquis* units elected their own leaders and did what they pleased; others were no better than gangs of criminals.

Mr Pearson has written a fine book but he shows a glaring lack of scholarship by mis-identifying almost every weapon mentioned in the text "German 6.3 burp guns" (p.83), "13.7 mm machine guns" (p.84), "World War I FM Model 1924/29" (p.129), "Junker 52 bombers" (p.251).

Tears of Glory is exciting reading, but more importantly it demonstrates just what happens to brave soldiers when their generals become politicans.

WILLIAM M. BROOKS, JR.
Wilmington, N.C.

GIVING UP THE GUN: JAPAN'S REVERSION TO THE SWORD, 1543-1879 by Noel Perrin. Published by David R. Godine, 306 Dartmouth Street, Boston, Mass. 122 pages. $8.95.

Giving Up the Gun is a concise, informative, and fascinating account of an anomaly of history wherein a nation that eventually became a highly industrialized military power turned its back on technology. Noel Perrin's description of Japan's ready acceptance of firearms in the early 1500's, the role matchlocks played in the rise of the Tokugawa shoguns, and subsequent rejection of the gun in favor of the legendary samurai sword moves rapidly and informatively.

The book is also an abbreviated discussion of the samurai and their predominance in Japanese society through the late 1800's and thus establishes the background for Perrin's conclusion that symbolism and aesthetics were among the principal reasons why the Japanese turned their backs to the gun when the rest of the world was continually seeking more efficient military weaponry.

Although the brevity of the book might be criticized by some, it is so well footnoted that the military historian, firearms collector, or devoted Japanophile will find it a worthy addition to the library. The book can also be recommended for its typography and illustrations, the latter being black and white reproductions of original prints by such renowned Japanese artists as Toyokuni and Hokusai. It is regretful that more color was not used. Even so, the very readable Waverly type, printed on Warren's Patina, makes the book a very handsome product.

ARMOR STAFF

ARMIES OF THE NAPOLEONIC ERA by Otto von Pivka. Taplinger Publishing Company, New York, 1979. 265 pages. $17.95

Readers with more than a casual interest in the literature of the Napoleonic Wars are probably familiar with Otto von Pivka. His previous works have included a history of the King's German Legion as well as surveys of the Spanish, Portugese, and German Armies of the Napoleonic Era. His latest book is a comprehensive examination of armies and military practice from 1792 to 1815. Entitled *Armies of the Napoleonic Era,* it encompasses the early wars of the French Republic, the subsequent wars of the Empire, and culminates with the Hundred Days and Waterloo. It is structured throughout to give the reader an understanding of the etiology and development of the tactical systems that dominated Europe's battlefields. The introduction acquaints the reader with the armies of the *ancien regime.* Part of von Pivka's approach is that the Napoleonic mode of warfare is understandable only in context with earlier forms. Recruiting, logistics, and tactics are emphasized.

After laying the groundwork, the author introduces the reader to weapons, equipment, and tactics. Major small arms and artillery are described in a text that is well complemented by an excellent series of line drawings and charts. Data is wide-ranging and includes items such as the speed of a cavalry charge, mixture ratios for gunpowder, crew duties on a field piece, ranges of all weapons, and how to conduct a retreat under enemy pressure. The Napoleonic style of combined arms and contemporary tactical doctrine are clarified in a well-written text with excellent supporting diagrams. Each combat arm is covered but, in this book, as in the actual series of wars, artillery predominates. Napoleon was an artillerist and relied heavily upon that arm as a source of covering fire to screen friendly movement or prepare a critical sector prior to attack. Consequently, much space is devoted to the use of artillery tactics, ranges, and types of ammunition. The other combat arms are not neglected, however. Cavalry's and Infantry's roles in the overall scheme, their weapons and tactics are also discussed. While extensively detailed information such as rates of fire and ranges may put off the casual reader, inclusion of this hard data is important. To understand completely the dynamics of the Napoleonic battlefield, one must first be familiar with the limitations imposed by the weapons. The equipment to a great extent dictated the tactics and von Pivka makes this relationship quite clear.

The second half of the book, entitled "National Sections," provides a thumbnail sketch of the armies of 41 states participating in the Napoleonic Wars. France, Britain, Russia, and Austria are joined by the United States, Netherlands, Kleve-Berg, and the Hanseatic Cities. Each national section discusses army organization, uniforms, and the campaigns and major battles of each nation. The relative scale of involvement as well as the worldwide nature of the conflict become clearer after reading the national sections.

Armies of the Napoleonic Era is a thoroughly researched and clearly written guide to an important period of military history. It is an excellent companion to the *West Point Atlas of the Napoleonic Wars,* Chandler's *Campaigns of Napoleon,* or Michael Glover's recent *History of the Napoleonic Wars.*

A list of major clashes and battles with dates of the encounters and the victors constitutes the appendix. The bibliography is the weakest part of the book. Obviously, it is quite impossible to even attempt anything approaching a complete listing of 24 sources, many of which are not in English—a factor that does not help the reader to any great degree. This is particularly true of those readers without a strong background in the subject. Since the book is such a good reference source, this lack mars the effort.

The judiciously selected contemporary illustrations in halftone both enhance the reader's understanding and

give something of the "flavor" of the Napoleonic era.

On the whole, this is an excellent book and, for the serious student, worth the cost. Later this year, a companion volume on the navies of the Napoleonic era will be published by the same author. Together, these two books should make a valuable contribution to the literature of this period.

ROBERT STACY
Laconia, NH

Recognition Quiz Answers

1. German *Schutzenpanzer 12-3* MICV. Armed with a Hispano-Suiza 20-mm *HS-820* cannon and a 7.62-mm machinegun. It carries a crew of three and a 5-man infantry squad. The predecessor to the *Marder*, it has been replaced in frontline units, but can still be found in service with West German reserve units.

2. British *Cheiftain Mk 5*, with 120-mm rifled gun. A 12.7-mm ranging MG is mounted over the main gun, and 7.62-mm MG coax is mounted to the left of it. Another 7.62-mm MG mounted at commander's hatch can be controlled from within the tank. Thermal shield on gun barrel. Smoke grenade launchers on each side of turret. In service with Iran, Kuwait, and the UK.

3. Soviet *ZSU-57-2*. Self-propelled AA vehicle with two 57-mm guns. Four roadwheels, large turret with slightly sloping sides. Replaced by *ZSU-23-4*, but still found in Soviet second-line units and most Warsaw Pact countries. Also highly effective in the ground role against everything less armored than a tank.

4. U.S. *M-60A1* with 105-mm gun. Needle-nosed turret, commander's cupola hatch opens to rear, zenon searchlight fitted to mantlet over main gun; blast simulator mounted over bore evacuator. This USMC tank is taking part in an exercise at Ft. Irwin, CA.

5. German *Leopard I* with 105-mm gun. Seven road wheels and drive sprocket in rear. Track skirts normally installed are missing. Cast turret with conventional armor, rangefinder housing at top right side.

6. Soviet *ASU-57* with *Ch-51M* 57-mm gun. An airportable, self-propelled antitank gun in service with Egypt, the USSR and Yugoslavia. Deployed in Soviet Airborne or Airborne Rifle Divisions.

All photos US Army Photographs. Photos 2, 3, 5 and 6 from U.S. Foreign Science and Technology Center.

INTELLIGENCE REQUIREMENTS FOR THE 1980's: ELEMENTS OF INTELLIGENCE. Edited by Roy Godson. National Strategy Information Center, Inc. Washington, DC. 91 pages.

The implications of recent executive and congressional addressal of the role of the intelligence community in an open society has yet to be determined. What is certain, however, is that intelligence needs will continue to change in the next decade and that the intelligence community must adjust its operations and organization to meet these evolving issues. The Consortium for the Study of Intelligence, a group comprised of scholars interested in national security policy, law and the role of intelligence, was formed to analyse the intelligence requirements in the 1980s. The major group goal was to determine what improvement measures the intelligence community must take to meet the envolving intelligence requirements of the future.

This book, the product of the Consortium's endeavors, is a compendium of four papers presented by individuals with notable intelligence credentials. Topics of these papers include the areas of analysis and estimates, clandestine collection, counterintelligence, and covert action. Immediately following each paper is a summation of discussion offered by a panel of scholars and intelligence professionals.

The thread of the effects of intelligence community reform as outlined in Senate Bill S.2525 and executive order 12036 runs throughout the papers presented by Lieutenant General Daniel O. Graham (analysis and estimates), Michael M. Uhlmann (approaches to reform of the intelligence community), Samuel Halpern (clandestine collection), and Newton S. Miler (counterintelligence).

The unclassified conclusions of this study group will come as no surprise to the intelligence professional but may serve as an interesting summation of intelligence community operations for the casual reader. The book does offer something of value to the professional in the last section where the new Executive Order 12036 governing United States Intelligence activities is outlined in detail.

R. P. VANDE HEI
Lieutenant Colonel

☆U.S. GOVERNMENT PRINTING OFFICE: 1980—657-127/3

THE ARMOR DESK

". . .to simulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters" is why **ARMOR** or any other Army journal is published.

Numerous articles have recently been received on light tanks and rapid deployment forces. A few appear in this issue, more will follow. Hopefully, these articles will stimulate further lively discussions in **ARMOR.**

Several issues past, I appealed for articles on the integrated battlefield—one of the "hottest" topics in the U.S. Army today. (See "Commander's Hatch" on page 6). Yet, not one article has been received. To get the dialogue going, **ARMOR** needs articles from officers and noncommissioned officers who were in the Army in the fifties and early sixties when we trained diligently to fight on a chemical, nuclear, and conventional battlefield.

Forty years ago our Army was short on modern equipment, funds for training, and personnel, not unlike today's Army. But professional military men did not lose faith. They wrote, and their published thoughts and ideas bore fruit during World War II, and brought us Victory. Likewise, we cannot afford now not to take the time to share our thoughts and ideas to aid one another in meeting the challenges of today's and tomorrow's Army.

Several other points: Armor officer membership in the Armor Association is now 42 percent, up 20 percent in the past 5 months. Well done! But let's push it past 50 percent by the end of the year and attract more NCOs to our ranks. **ARMOR** too has been hit by inflation, necessitating a rate increase effective with renewals and new subscriptions received after 1 December 1980. The new rates for **ARMOR** mailed to domestic, APO, and Canadian addresses are: one year \$10.00, two years \$19.00, and three years \$28.00. Foreign subscriber rates will be: one year \$15.00 and two years \$28.00.

13th Armor

(13th Horse)

The regiment was organized in 1901 at Fort Meade, South Dakota, and has served in the Philippines and along the Mexican border. The sun in splendor is taken from the flag of South Dakota; the wreath shows the Philippine and border service.

On the organizational flag the scroll of the regimental badge is omitted and the motto is placed on the scroll in the eagle's beak. This badge is in lieu of a coat of arms.

13th ARMOR

(13th Horse)

Constituted 2 February 1901 in the Regular Army as 13th Cavalry. Organized 1 May 1901 at Fort Meade, South Dakota. Assigned to 2d Cavalry Division 1 March 1933—18 August 1936. Reorganized and redesignated 16 September 1936 as 13th Cavalry, Mechanized. Reorganized and redesignated 15 July 1940 as 13th Armored Regiment and assigned to 1st Armored Division.

Regiment broken up 20 July 1944, and its elements reorganized and redesignated as elements of the 1st Armored Division as follows: Headquarters and Headquarters Company, Service Company, and Companies D, E, and F as 13th Tank Battalion; 3d Battalion and Maintenance Company as 4th Tank Battalion; Reconnaissance Company as Troop D, 81st Cavalry Reconnaissance Squadron, Mechanized; Headquarters and Headquarters Companies, 1st and 2d Battalions, and Companies A, B, and C disbanded.

13th Tank Battalion converted and redesignated 1 May 1946 as 13th Constabulary Squadron; concurrently, relieved from assignment to 1st Armored Division and assigned to 10th Constabulary Regiment. Inactivated 20 September 1947 at Coburg, Germany, and relieved from assignment to 10th Constabulary Regiment. Converted and redesignated 27 February 1951 as 13th Medium Tank Battalion and assigned to 1st Armored Division. Activated 7 March 1951 at Fort Hood, Texas. Reorganized and redesignated 20 May 1953 as 13th Tank Battalion. Inactivated (less Company A) 15 February 1957 at Fort Polk, Louisiana (concurrently, Company A reorganized and redesignated as Headquarters and Headquarters Company, 1st Medium Tank Battalion, 13th Cavalry).

4th Tank Battalion converted and redesignated 1 May 1946 as 72d Constabulary Squadron; concurrently, relieved from assignment to 1st Armored Division and assigned to 10th Constabulary Regiment. Inactivated 20 September 1947 at Boblingen, Germany, and relieved from assignment to 10th Constabulary Regiment. Converted and redesignated 27 February 1951 as 4th Medium Tank Battalion and assigned to 1st Armored Division. Activated 7 March 1951 at Fort Hood, Texas. Reorganized and redesignated 20 May 1953 as 4th Tank Battalion. Inactivated 15 February 1957 at Fort Polk, Louisiana.

Troop D, 81st Cavalry Reconnaissance Squadron, Mechanized, reorganized and redesignated 1 May 1946 as Troop D, 81st Constabulary Squadron; concurrently, relieved from assignment to 1st Armored Division and assigned to 3d Constabulary Regiment. Inactivated 20 September 1947 in Germany, and relieved from assignment to 3d Constabulary Regiment. Redesignated 27 February 1951 as Company D, 81st Reconnaissance Battalion, and assigned to 1st Armored Division. Activated 7 March 1951 at Fort Hood, Texas. Inactivated 15 February 1957 at Fort Polk, Louisiana.

Headquarters and Headquarters Companies, 1st and 2d Battalions, and Companies A, B, and C, 13th Armored Regiment, reconstituted 15 February 1957 in the Regular Army.

13th and 4th Tank Battalions, Company D, 81st Reconnaissance Battalion, and reconstituted elements of the 13th Armored Regiment consolidated, reorganized, and redesignated 15 February 1957 as 13th Cavalry, a parent regiment under the Combat Arms Regimental System; 13th and 4th Tank Battalions and Company D, 81st Reconnaissance Battalion, concurrently relieved from assignment to 1st Armored Division (Headquarters, 13th Tank Battalion concurrently redesignated as Headquarters, 13th Cavalry). Reorganized and redesignated 3 February 1962 as 13th Armor.

Campaign Participation Credit

Mexican Expedition
  Mexico 1916-1917

World War II
  Algeria-French Morocco
    (with arrowhead)

Tunisia
Naples-Foggia
Anzio
Rome-Arno
North Apennines
Po Valley

november-december 1980

ARMOR

US ARMY

ARMOR SCHOOL

"To disseminate knowledge of the military arts and sciences, with special attention to mobility in ground warfare; to promote professional improvement of the Armor Community; and to preserve and foster the spirit, the traditions, and the solidarity of Armor in the Army of the United States."

ARMOR

the Magazine of Mobile Warfare

November-December
Vol LXXXIX, No. 6

COVER

"Division 86 will provide an objective force from which analysis of the equipment and personnel requirements can be conducted, and the necessary follow-on decisions made...." These words of General E. C. Meyer, Chief of Staff of the Army, emphasize the importance of the Division 86 studies. See page 30 for more on its possible impact on Armor.

ARMOR Magazine is published bimonthly by the U.S. Army Armor School, 4401 Vine Grove Road, Fort Knox, Kentucky 40121, to stimulate interest in, provoke thought on, and provide an open forum for decorous discussion of professional matters. Unless otherwise stated, material does not represent policy, thinking, or endorsement by any agency of the U.S. Army. Use of appropriated funds for printing of this publication was approved by the Department of the Army, 25 April 1980. **ARMOR** is not a copyrighted publication but may contain some articles which have been copyrighted by individual authors. Material which is not under copyright may be reprinted if credit is given to **ARMOR** and the author. Permission to reprint copyrighted material must be obtained from the author.

SUBSCRIPTION RATES: Individual subscriptions to **ARMOR** are available through the U.S. Armor Association, Post Office Box O, Fort Knox, Kentucky 40121. **Domestic:** $10.00 one year, $19.00 two years, $28.00 three years. **Foreign:** $15.00 one year, $28.00 two years. Single copies, $2.00.

CORRESPONDENCE: Address all correspondence to U.S. Army Armor School, ATTN: ATZK-MAG, Fort Knox, Kentucky 40121. (Telephone: AUTOVON 464-2249/2610 or commercial (502) 624-2249/2610.)

POSTMASTER: Controlled circulation postage paid at Indianapolis, Indiana, Department of the Army, DOD 314.

ARMOR may be forwarded to military personnel whose change of address is caused by official orders (except to APO addresses) without payment of additional postage. The subscriber must notify the postmaster.

USPS 464-510

LETTERS

"20/20" Replies

Dear Sir:

The July-August 1980 issue of ***ARMOR*** included an article, "A Rebuttal to '"20/20,'" which contains some misapprehensions and plain misstatements that must be corrected.

David C. Holliday, Lieutenant Colonel (Ret.) accuses me of an unfair attack on the armored problem, the *XM-1*. In the process, he commits the following distortions.

1) He quotes at length from some of my opening statements, concluding with an alleged final judgment, "it doesn't work." In fact, the final phrase was, "it doesn't work *right;*" a different judgment, no?

The exact judgment, I believe, of a "blue ribbon panel" which completed its analysis of the *XM-1* just a few weeks after we completed work on our report this January.

Among the things that didn't work right, the tank could not be depended upon, in the panel's judgment, to run without failure much more than 100 miles. Colonel Holliday ignores our reportage, which followed upon "right now, it doesn't work right," by less than a couple of minutes, that "The *XM-1* is faster, quicker, and smoother riding....It can fire farther... faster... and with a better chance of hitting the target." The tank simply has problems as well as capabilities.

2) As Holliday puts it: "Marish (sic) stated, 'In one important test, the crew said they could hit better with the automatic system turned off.' This is an apparently true statement."

No. Colonel, it *is* a true statement. And furthermore, it's happened before. An old armor man like yourself might recall in World War II that many "old tankers" improved results by making "optional" some standard gunnery equipment. There are a lot of Vietnam pilots who also had to improvise around the official optimism about the reliability and usefulness of some of *their* automatic targeting and firing systems.

3) The survivability question: here Colonel Holliday's misquotation isn't just "literal," as in the case of "it doesn't work *right,*" it's visual as well. Colonel Holliday alleges we questioned the survivability of an *XM-1* while inaccurately showing it being blown up by a mine. In fact, we said this tank is, in the Army's opinion, the most survivable tank yet, even against the most violent kind of direct hits. This we illustrated by showing the *survival* of the mine-struck tank. We questioned the tank's survivability not against powerful mines but against a new generation of small, portable, antitank missiles, which, when compared with the *XM-1* are cheap, as well as troublingly effective.

Several times in his "Rebuttal," Colonel Holliday claims to have sources telling him what I "really felt" about parts of the piece. I don't know who these "sources" might be. I do know they are wrong.

Colonel, let me tell you what really got me mad. What this piece lost to the editor was confirmation that two trend lines are headed for a dangerous intersection in the last half of the 1980's. These trends are development of even smaller, lighter and more accurate antitank weapons and the deployment on the battlefield of the very large and expensive *XM-1*. The man confirming this intersection was none other than the Penagon's weapons R&D chief, Dr. William Perry.

As Colonel Holliday says, and as we ourselves had said in another segment which fell victim to the clock, people have been predicting, wrongly, the end of the tank for decades now. But there are dangerous new data to be considered, and armor displacement like the XM-1's, in part designed to respond to 30- to 40-year old targeting patterns may not be the perfectly survivable answer.

4) The filtration problem: again Colonel Holliday mistakes what he claims to be rebutting. "20/20" never gave a false impression an XM-1 had dropped dead and thereby been forced to clean it's filter. We merely filmed the Army's illustration of how the filter must be cleaned. We noted it placed men in an exposed position that "might be...touchy...someplace more warlike than Kentucky." We neglected to mention that Army tests suggested some crews might have to take cover and clamber to the tops of their *XM-1s* to change filters every 2 hours or so.

Colonel Holliday again cites "sources," claiming I was incensed because I wanted to film some previous filter-cleaning technique involving toilet brushes in order to put the poor tank in a worse light. I frankly don't know what Colonel Holliday is referring to, but I sure do get incensed about his implication that I was searching for extra nits to put on the *XM-1's* back. I wish such an extensive search were necessary.

Like many, if not most critics of the Army, I'm on "our side." I want us to buy weapons that do work right; I worry when we advance the production process on weapons still not functioning acceptably. Harry Thomas and Bart Mandel no doubt feel the same way. They are two engineers who testified in our report to their early and consistent warnings about potential difficulties with the *XM-1's* turbine engine. Colonel Holliday's sources seem to have misinformed him about Harry and Bart, as well. They did indeed criticize an Army truck engine. Their criticisms weren't accepted till the truck had proved a poor performer for men in battle (in Vietnam), some of whom, no doubt, lost their lives because of anticipated failures. President Johnson officially praised Harry and Bart for their steadfastness in their critiques, despite heavy pressure from ranking Army personnel. Their steadfastness in criticising the *XM-1* engine cost them their jobs. They were shut up, their criticisms shut out of the Army's discussions of tank planning. These criticisms of the turbine engine are not considered beneath discussion by many leading publications in the field of military technology. These criticisms may not at all be universally accepted, but they are discussed openly and respectfully, without resort to misquotations, misattributions, or made-up sentences like, "Look you have your generals..and I have mine."

A final request: when such quotations are made, when anecdotes are printed to suggest a reporter has slanted a story or disowns any part of it, it is common courtesy and professional duty to check with the reporter being so quoted. Neither Colonel Holliday nor anyone from *ARMOR* ever checked any of this with me. Let's save the sneak attacks for military enemies.

DAVE MARASH
ABC News

The Trend Toward Conservatism

Dear Sir:

I read with great interest General Starry's article in the July-August issue of ***ARMOR*** ("Does Armor Have a 'Ho Hum' Attitude?"). The article brings to mind some facts regarding this attitude as it relates to Armor branch.

We often forget that the Army is a

highly bureaucratic organization with inherent tendencies towards conservatism. Because the various branches within the Army are, in a sense, separate bureaus, Armor's current mind-set (or "Ho Hum" attitude) is a product of tendencies which are inevitably a part of the aging process of any organization.

Armor's birth as a separate branch is a story of the actions of a number of far-sighted advocates and zealots, (for example, Van Voorhis, Brett, Chaffee, and Patton) who were, in General Starry's words, not afraid to "seize the initiative—in training—in operations—in battle—in victory." However, Armor's struggle for autonomy as a separate branch and its resulting growth resulted in an organization which displayed characteristics common to all organizations as they age: the tendency to become increasingly conservative. Whether or not such a trend is irreversable is especially important to an organization with the important mission of the Army.

The important thing for one to keep in mind is that the complacency which is the result of the effects of age upon organizations should be recognized as a threat and dealt with accordingly by all members of Armor branch. General Starry's article brings out the important point that such attitudes have negative affects upon the quality of leadership, motivation, and training of the Armor soldier.

This is not to say that constructive conservatism cannot exist within the Army. What we must do, however, is not to let concern for the conservation of present resources, in a time of austerity, lead to attitudes which let us neglect our past and more importantly, neglect the quality of our readiness.

EDWARD G. MILLER
Second Lieutenant, Armor
Fort Knox, KY

Reader Assistance

Dear Sir:

I am in the process of gathering information on the:

Cadillac Gage *V-100* Armored Car
Cadillac Gage *V-150 Commando*

Primarily, I desire first person opinions of the vehicles, particularly the capabilities and limitations. Comments on the advantages, shortcomings, and suggestions for correction/modification are welcome.

All photographs will be copied and returned, unless otherwise indicated. Photographs showing damage sustained, modifications made in the field, and "wear" problems would be welcomed.

Should any of the readers have knowledge as to where I might locate any of the publications used in the operation and maintenance of these vehicles, it would be appreciated.

Having been a member of the Armor Assoication for many years, and a "Treadhead" from the thoughtful days of the *M-4*, the readers of ***ARMOR*** are my best source.

EDWARD J. HERTERICH
GySgt (Retired), USMC
P.O. Box 714
San Marcos, CA 92069

Determination in Battle: Other Factors

Dear Sir:

In referring to a recent article called "Determination In Battle" (May-June 80) by Major General T. S. Hart, I would like to say that it is an excellent article and that I actually saw myself in some parts and it made me realize things even more.

In his article he says in the section on fear that determination in battle has a lot to do with fear itself: the unexpected, the unknown, fear of failure, the noise and sight of battle, fear of killing, and exhaustion.

In the courage section he says that the strength of the well-integrated group, the group identification, leadership, discipline, and success can have a lot to do with one's courage.

He does not mention *equipment* once in either section. Equipment can affect you mentally. If a soldier knows that his equipment is superior (not necessarily more than) he will then have a different mental attitude than if his equipment is inferior. You cannot expect a soldier who has to fight with inferior tanks to have the same mental attitude as the soldier who is fighting with superior tanks—even if they're both good soldiers, with good leaders, good discipline, and are not afraid to fight. One will still feel different from the other.

Another point is *home reaction.* No matter how he's trained, news from home will affect him (I am not talking about "Dear John" letters). I'm talking about how the people back home feel about how they're doing.

For example let's say there's a bunch of soldiers and they know that they've been fighting very hard with good success. Then one of them gets a letter, let's say from his mother, and it states that she's been hearing from the news that they have not been fighting well at all and have been slacking off. Now that can do two things to them: either make them very sad and make their morale really low, or make them upset and mad enough to fight like crazy. Now if the letter is good news, it can give them added confidence and make them continue to fight well.

So what I'm trying to say is that equipment and news from home can affect you mentally one way or another.

STEVEN L. FIXLER
Private First Class, Armor Crewman
Co. C, 2-68 Armor, 8th ID

Let the "Top" Train

Dear Sir:

The first sergeant occupies the most misunderstood position of responsibility in the Army. He holds an unusual place in the chain of command—but he is not in it. The chain of command goes from the platoon sergeant to platoon leader to the company/troop commander. This situation has existed in nearly every major army for the past several hundred years. This is not to say "Top" has no powers or duties, however.

Originally, the first sergeant was responsible for the training and equipment readiness of his unit. This existed up to around WW II when he was pulled more and more into the orderly room as the administrative load of modern war grew. Today the first sergeant, from my experience, has nothing or almost nothing to do with training and equipment readiness. He inspects the unit area, holds formation and takes care of the paper work.

An experienced NCO has been removed from what he knows best and is literally retrained to do a new job. This is the greatest waste of personnel and money I can think of, other than MOS mismatches. We can no longer afford to waste the first sergeant, and far too many hours have been lost by him in keeping paperwork straight.

To get the first sergeant back into his proper job, a means of getting him out of the orderly room is needed. Giving each company/troop a desk sergeant (my term), who takes over *all* the things that tie the first sergeant down, should accomplish this. The desk sergeant would be someone trained in all the administrative duties that a first sergeant is now responsible for. No matter what the rank of this person, he would have the authority of the first sergeant behind him so that should not present a problem.

The military situation we face in the world today makes it necessary for us to use all of our resources to the maximum possible degree and the first sergeant is one of those resources.

CHRISTOPHER F. SCHNEIDER
Sergeant
Troop A, 1/238 Cavalry Squadron ARNG

THE COMMANDER'S HATCH

MG Louis C. Wagner, Jr.

Commandant

U.S. Army Armor School

Range Bands of Engagement for Target Servicing

The Armor Center has initiated efforts to determine more precisely the optimum target servicing techniques and range bands of engagement for the major weapons systems expected to participate in the central armored battle, now, and in the near future. This analysis will focus initially on tank systems, but ultimately will include all antiarmor weapons systems which, when combined with tank systems, provide an integrated target servicing capability. The reason for such an effort is clear. Technological advancements in armored and armor-defeating systems are a continuing process and numerous new systems with improved capabilities have been, or soon will be, fielded. The impact of these technological advancements must be assessed and doctrine refined for the employment of each weapon system to achieve maximum effect as part of an overall target servicing effort. The goal must be to achieve optimum integration of systems to avoid either wasting critical assets through duplication of effort or failure to employ systems within capabilities.

The tank is the key to the central battle. Its employment must be considered first. An analysis of the main gun exercises prescribed for the main battle tank will indicate that, in both offensive and defensive scenarios, crews are trained to optimize the system at ranges less than 2,000 meters. It is within this range band that reasonable probabilities of hit are achieved. These probabilities are the result of many influences inherent in a weapons system and its environment. These influences act upon the projectile from the time it is loaded into the chamber until the time it ends its flight. Some of these influences are compensated for by advanced tank fire control systems. Others are compensated for through crew training. In spite of these compensations, it must be recognized that the longer a round of ammunition stays in flight, the more time it is exposed to influences that either change its course or exaggerate initial errors. The greater the distance from gun to target, the lower the probability of hit. In addition to range, the amount of the target that is exposed and target movement also affect probability of hit. Stationary, fully exposed targets improve chances of target hit.

More important than hitting the target is killing the target. As with probability of hit, probability of kill is dependent on a variety of factors, not the least of which is the target's armor protection, the orientation of the target to the gun, and the type of ammunition employed. While range is not a factor in the penetration capabilities of chemical energy (HEAT) rounds, it is a critical factor with the primary armor defeating kinetic energy

(SABOT) rounds. Kinetic energy rounds lose the full potential of their penetrating capability as ranges are extended.

These facts indicate that close attention must be given to when and where various targets are engaged. Armored combat will be intense, violent, and mobile, with a high volume of direct and indirect fires. Maximum kill potential must be obtained from each round fired. Lightly-armored vehicles and the lightly-armored portions of tanks can be engaged at the longer ranges, provided there is a good probability of hit. Both primary tank main gun rounds provide a good probability of kill against these targets. The heavy frontal armor of tank targets should be attacked with SABOT—the primary armor defeating round—at closer ranges where the round still possesses its full penetrating capability.

All this can be translated into techniques for target servicing by tank systems as follows:

- Attack lightly-armored targets, such as antitank, air defense, and command and control systems, at the longer ranges.
- Attack heavily-armored vehicles from the flank when engagement at the longer ranges is necessary.
- Attack tank frontal armor at the closest possible range consistent with the mission.
- In every instance, attempt to develop stationary, fully-exposed targets through terrain reinforcement.

This concept of selective target servicing for maximum kill potential at each engagement can result in the "tank-to-tank" battle occurring at ranges closer than sometimes anticipated. This likelihood will require engaged tank forces, at some point in the battle, to be fully committed to the task of rapidly killing tanks in a short period of time. There will be little time for reporting events or issuing and receiving orders. It will require full knowledge of planned subsequent actions on the part of all committed units, and the skillful use of other weapons systems if and when a decision to break contact is made. Full use of the protective elements of the terrain will have to be made since engagements at close ranges to gain a higher payoff per round against threat tanks will mean risking potentially higher friendly losses. Finally, it will require that tank units be prepared to fight when isolated by threat forces or when supporting other isolated units.

Having established a target servicing sequence for tank systems, other weapons systems can be more logically integrated into the central battle. Employment of these systems also depends upon hit and kill probabilities. The hit probabilities for ground and helicopter delivered antitank guided missiles (ATGM), such as the TOW, are high at long ranges because of the greater degree of control that can be exercised over the path of flight. Because these are HEAT munitions, kill probabilities do not decay significantly with range. These long-reaching systems are ideally suited for antiarmor engagements in range bands well beyond those effective for tank systems. Just as with the tank gun, flank shots, allowing engagement of the lightly-armored portions of heavily-armored vehicles, produce a higher kill capability. And just as with the tank, TOWs are especially lethal against lightly-armored vehicles. Rate of fire and survivability are concerns in the employment of these missiles.

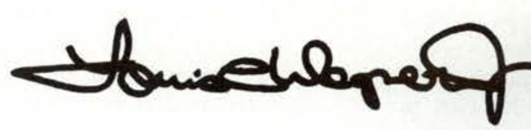
It is probable that ATGM systems would spend considerable time moving, following firings, to survive threat counteractions. Movement time needed to lessen this vulnerability must be taken into consideration when assessing the ATGM's contribution to the target servicing effort. In addition, neither ground TOW systems nor attack helicopters have high chances of survivability in the close-in tank battle. However, through skillful employment these systems can be moved off, rearmed, and reintroduced into the battle for subsequent offensive actions or overwatching fires to allow tank units flexibility of maneuver on the battlefield.

Close air support adds another dimension to the overall antiarmor capability by extending even further the depth at which threat armor systems can be defeated. Further enhancement of armor defeating capabilities can also be expected with the introduction of the Fighting Vehicle Systems with their light, armor-defeating automatic weapons. These systems will allow tank systems a greater degree of flexibility and provide tanks with the opportunity to devote more firepower to attacking heavily-armored threat systems.

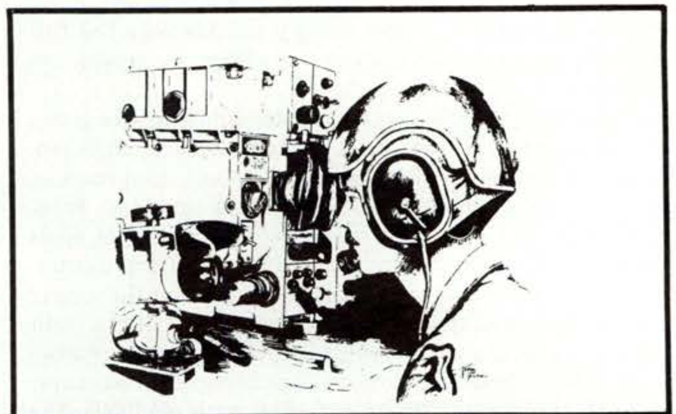
The contribution of indirect fires must also be considered. Although artillery is not presently employed as a primary armor defeating system, with the future introduction of Copperhead, a laser designated antitank artillery projectile, the commander's ability to destroy armor targets at great ranges without exposing his positions will be enhanced. The ability to deliver scatterable mines represents an added capability to defeat threat armor systems, extend engagement times by impeding movement, and create more lucrative targets by forcing threat vehicles to expose their flanks. Complementing this capability is the artillery's ability to deliver a high volume of long-range fire that can contribute to disruption of the threat's tactical timing and control of antiarmor systems.

In summary, target servicing in the central battle must be based on the interaction of a variety of antiarmor systems and supporting capabilities. The tank is essential to success in this battle, but must be complemented by other systems. Through the skillful handoff of target attack from one weapon system or group of systems to another, capitalizing on the strengths of each system, continuous and increasing attrition of the threat can be attained from the time of acquisition to final destruction.

Determination of range bands of engagement for each of these weapons systems, or combination of weapons systems, is an item of high priority at the Armor Center. The results of these analyses will be provided to the field as they become available. Concurrently, more precise information on range bands of engagement will be incorporated in the continuing revision of the doctrine for employment of armor forces as successful combined arms teams.



Master Gunner's Corner



This article is to enlighten students who are scheduled to attend the Master Gunner Course on various problems experienced by previous students at the U.S. Army Armor Center.

A recent analysis of the Master Gunner Course has revealed two major areas causing some students academic problems: basic mathematics and use and operation of the multimeter.

It is recommended that prior to the beginning of the course a student should review basic math principles. The areas of concern are decimals, fractions, general addition, subtraction, multiplication, and division. Basic mathematics is used throughout the gunnery portion of the Master Gunner Course. The students are required to work problems in range determination using the mil relation (or WORM) formula, training devices (making scaled ranges and measuring scaled targets) and firing tables (ballistic solutions). Sample problems follow.

A threat tank moving across your front, measures 5 mils in your binocular reticle. Determine the range to the tank.

Since a threat medium tank is approximately 6.5 meters long the solution would be:

$$R = \frac{W}{M} = \frac{6.5}{5} = 1.3$$

Since R is expressed in thousandths, 1.3 must be multiplied by 1,000, refer to page 7-7, FM 17-12.

Solution: $1.3 \times 1{,}000 = 1{,}300$ meters.

How many inches long must a scale target be to represent a 1/20 scale flank view of a threat medium tank?

Solution: $6.5 \div 1/20 = \frac{6.5}{20} = 0.325$ meters

To find inches, multiply .325 by 39, since there are slightly over 39 inches to a meter.

$$.325 \times 39 = 12.675 = 12.7 \text{ inches}$$

The video tapes, 071-0920B thru 071-0924B, will help the student prepare himself for the Master Gunner Course.

During the turret maintenance portion of the course, the student will be using two types of multimeters—the TS 352B/U and AN/URM 105C. First, the student will be required to complete programed texts on use of the multimeter. Later, he will be required to measure voltage, resistance, and perform continuity checks while actually working on electrical systems. A portion of the first examination will include use of the multimeter. It would be of benefit for the student to familiarize himself with the operation and use of these multimeters, or at least the particular multimeter he has in his unit. The motor sergeant should be able to assist the student in learning to use the multimeter and read the various scales found on each type of multimeter.

Other problems relate to assigned class projects requiring documents and data concerning the student's parent unit. The student should have the following information and documents in his possession:

- The most recent after-action report for his unit's level I and II tank gunnery.
- The operational status of vehicles within his unit and the date of arrival of each vehicle.
- Information concerning the unit's level of proficiency and the skill level of each NCO and crewman.
- The student should know the strength of his unit and the number of tank crew positions that are filled.

Other unit strength data that is important for the student to have includes crew stabilization information, DEROS, ETS, and incoming arrival dates of all CMF-19 and -45 personnel. It is to the student's benefit that all items covered in this article receive attention prior to his arrival. He may then apply himself completely to the course.

SILVER W. CAMPBELL
Master Sergeant
Chief, Master Gunner Branch

Mini-Tank Range Construction—Parallax Considerations

A few of the many items which must be considered in the construction of a mini-tank range are: space available, subcaliber device intended for the range, the type of Scaled Range Target System (SRTS) on hand, the level of staff training in opposing forces tactics, and the availability of gunnery expertise or master gunners who can provide answers to the inherent problems associated with a weapon system designed to fire main gun ammunition and transforming it to fire the ever mighty "micro bullets" used in subcaliber firing.

One of the biggest headaches, however, in building and firing mini-tank ranges, is the phenomenon known as "parallax." The parallax that affects tank gunnery is divided into two categories; sight or individual parallax,

and systems parallax.

Parallax is generally defined as "the apparent difference in the position of an object when viewed from two different points." This is caused when the tank commander fails to adjust and secure the brow pad on the range finder or, in the case of the gunner, the gunner's brow pads. It can also be caused when the tank commander or gunner moves his head erratically while aiming at a target. Sight or individual parallax is minimized when the tank commander and gunnery develop proper and stable firing techniques.

When the sights are employed on a subcaliber range, the target distance is substantially reduced, thereby causing an increase in the field of view. This condition may cause the tank commander and gunner to experience Sight Picture Distortion (SPD). It's kind of like trying to use a binocular in the close confines of a classroom, where everything seems to be too close and too large. The result is not being able to focus the sight reticle and target simultaneously.

One solution to this problem is to cover the eyepiece of the tank sight with some opaque material pierced with a 1/16th-inch hole for viewing. This reduces the field of view enough to bring both the target and reticle into focus.

The second type of parallax, called systems parallax, is present because of the engineering design of the tank. It is the horizontal and vertical offset distance between the main gun boreline and the line of sight of the various optical sights used to align that gun (figure 1).

Systems parallax is eliminated only at the boresight range, by converging the line-of-sight with the line-of-bore. Additionally, at the boresight range, the line-of-bore and line-of-sight cross and systems parallax begins again as these lines diverge but in the opposite direction. When employing subcaliber devices, the systems parallax error now exists between the line-of-bore of the device and the optical sight being used. This error is especially evident in the vertical plane when using the subcaliber devices for Tables IV and V-P. Much of this problem can be reduced by boresighting and zeroing at the mid-point of the 1/60th or 1/35th scale range.

Another recommended solution to this problem will require attention to detail during mini-tank range planning and construction. The range should be designed in such a manner that the base of the tank turret is parallel to the target array. This is accomplished by digging out an area on the firing line to a depth of 48 inches (figure 2), or building the entire tank range on a platform or sandbox configured to a height of 48 inches (figure 3). This design feature or modification changes the vertical geometric posture of the target array and allows the tank sights and subcaliber devices to be within adjustable limits.

Many may feel that this modification will only produce a more realistic firing position. And while this may also be true, the foregoing parallax considerations are still an essential measure in the construction of a mini-tank range that will ultimately result in successful and accurate gunnery.

DANIEL E. ORTEGO
Staff Sergeant
Company A, 1-149th Armor, CALARNG

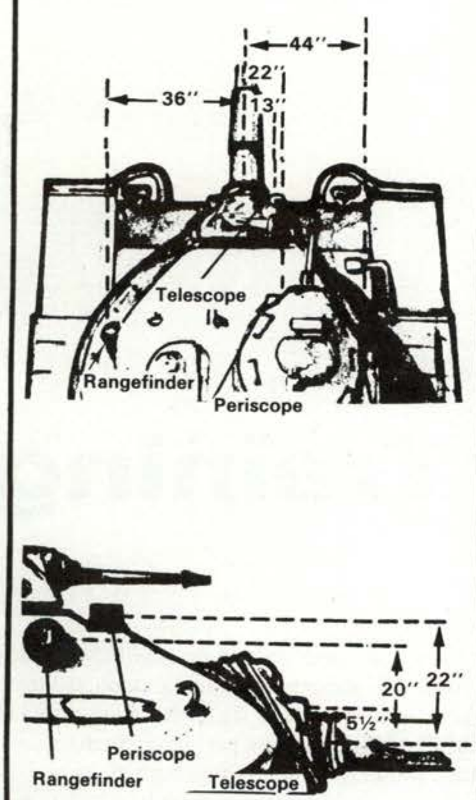


Figure 1

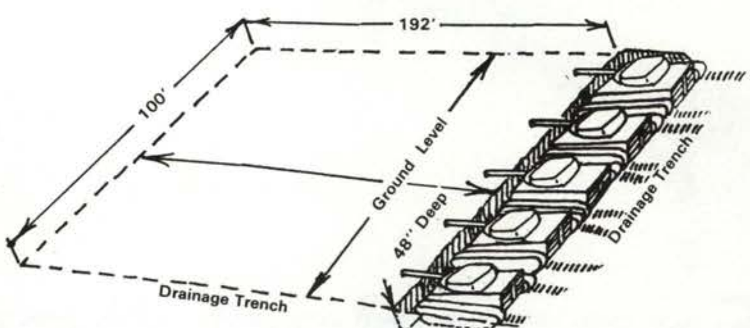


Figure 2

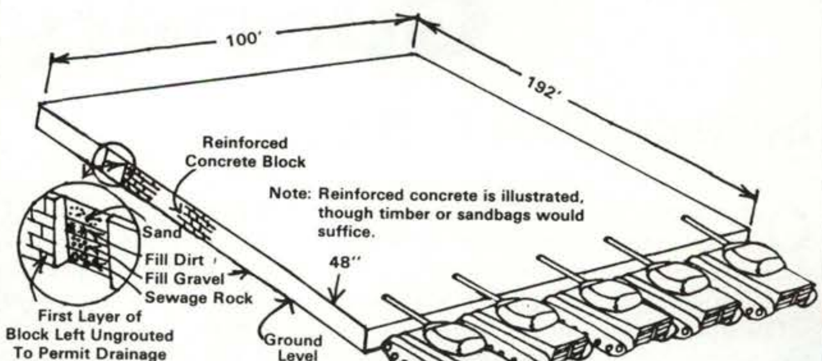


Figure 3

Expanded Aerial Gunnery Training

by Major Gale N. Smith

Our professional journals are full of articles about aerial gunnery training for attack helicopter units. But what about the air cavalry? More directly, what about Troop D—the armored cavalry squadron's air troop?

This article provides an overview of an expanded aerial gunnery program conducted by Troop D, 1st Squadron, 10th U.S. Cavalry, Fort Carson, Colorado. It is referred to as "expanded" for two reasons. First, the program is conducted as an integral part of a squadron maneuver and live-fire training program. Second, Troop D's gunnery program is conducted from a tactical site where those hazards to flight which are expected to be encountered in a battle area are pervasive. Such hazards include wires, dust, smoke, and units firing both direct and indirect fire support weapons. The overall squadron program is performance oriented so that soldiers learn by doing. The training is realistically designed and conducted to have a "pay

off'' now. In terms of readiness for combat, this approach to training focuses on ''being ready, not getting ready.''

Why expanded aerial gunnery training? I feel there are four basic reasons. First, unit readiness in terms of trained personnel and available materiel must be enhanced and sustained. The mission of the U.S. Army in peace is to be ready to fight and win the next land battle. The volatile world situation emphasizes the need to be ready; the strategic mobiity provided by our large transport aircraft magnifies the closeness of war—even in peace. Thus, to assure victory, our units must be ''combat ready'' to fight and win the first, middle, and last battle. By definition, a unit that can go immediately into combat and accomplish its assigned mission is combat ready.

Second, we need to train as we would expect to fight in combat. The armored cavalry squadron is an organic air-ground team. The team must train together to be effective. Therefore, the team effort should be the driving factor in training.

Third, we must train with the resources we have, and not wait for those we hope to get. We must not simulate resources for expediency. In short, we must train with the personnel and materiel on hand.

Fourth, we must take advantage of the land available for training. Ideally, in training, unit leaders should be able to maneuver their forces over an area which would approximate that envisioned during a combat scenario. But at the battalion level, however, the choice is simple—use the available land and time to train the entire unit simultaneously.

Not discounting the importance of what the Army Training and Evaluation Program (ARTEP) describes as ''ideal'' land required to train, we do not have it now; yet, we must train to be combat ready. I think the guidance for this situation was provided by General Hamilton Howze, when he said:

> ''Don't do everything according to the book; look at your mission, see what you have to do it with, then work out the most sensible (which may frequently be the most unusual and most audacious) way of doing it—and let fly. Use your brain, imagination, and initiative.''

Taking General Howze's advice, the 10th U.S. Cavalry developed a field training complex incorporating maneuver areas and range firing facilities. By design, the complex enables the squadron to conduct maneuver training and live-fire exercises for all subordinates units during a short period of time. This is accomplished by rotating units between maneuver areas and firing ranges. Thus, both types of training can be conducted at the same time. As it relates to Troop D, the complex makes use of available terrain to provide a variety of realistic firing positions which are accessible from maneuver areas.

Scope of Squadron's Program

The scope of training provides for an integrated air-ground team training side by side. The use of the complex is characterised by centralized planning and coordination and by decentralized execution. This allows a diversity of effort from individual/squad/section training, to troop-size maneuver and squadron command post exercises (CPXs)—all conducted under time and land-use constraints.

The range part of the complex consists of firing lanes for tanks; tube-launched, optically-tracked, wire-guided (TOW) and *Dragon* antitank missiles; scout and infantry squads; and support crews (maintenance, supply, mess trucks, etc.). The firing lanes used by tanks are used by other ground crews as well. Also, the aerial gunnery lanes are adjacent to ground firing lanes. This provides the flexibility of having aerial suppressive fires and overwatching fires for ground crews. In effect, all lanes can be used simultaneously. Indirect fire support for the complex is provided by the squadron's mortars (organic to each platoon), artillery, and U.S. Air Force tactical aircraft. Indirect fire support, including tactical air, can be employed at the same time that both helicopters and ground crews are negotiating their firing courses. *(See ''Crew Qualification Course,'' by Major V. Paul Baerman, ARMOR, September-October 1979, Ed.)*

All ground crews, including Troop D's aero-reconnaissance platoon, employ *(M-203)* high explosive (HE) hand and rifle grenades, and subcaliber light antitank weapons (LAWs), and demolitions during their firing course. Concurrent training stations are established for employment of bangalore torpedos, claymore mines, *fougasse* mines, antitank mines, and surface trip flares. In short, the range complex provides a comprehensive area in which all organic weapons, as well as Common Table of Allowance (CTA) weapons and munitions, can be employed and fired as the situation dictates.

The maneuver part of the complex provides an area where subordinate units can improve both individual and unit tasks and missions, as outlined in Soldier's Manuals, Aircrew Training Manuals for Troop D, and the ARTEP. Admittedly, the maneuver area is not large enough to conduct squadron-level tactical operations. The area is large enough, however, to teach doctrinal concepts. Furthermore, it provides a variety of areas and conditions whereby leaders and trainers can evaluate the soldier's perception of the subjects he is being taught by his performance. From a squadron-level perspective, this method of training is a step between sandtable training and full-scale maneuver.

The ''ideal'' training land would help soldiers gain a realistic appreciation of the time-space relationship we expect to have in future wars. But, the possibility of other scenarios cannot be discounted. To cope with the obvious land shortcoming, units are forced to train on maneuver tactics at company level while the battalion headquarters conducts a CPX. Thus, units must teach doctrinal concepts at local training areas to be ready to use the National Training Center effectively when it becomes available. Live-fire and maneuver training are conducted as the culmination of quarterly training and not as simply another fielding exercise. The squadron live-fire exercises go well beyond simulating the sights, sounds, and smells of war. The focus is on teaching cover, concealment, fire suppression, and teamwork while emphasizing the rigors of actual combat.

Photo by SP5 Bob Miles of the *Ironsides* staff

Using all available firepower and massing it at the critical place and time are continuously stressed. Working effectively as a combined arms cavalry team during live-fire operations is the ultimate training vehicle for the squadron. It enables unit leaders to bring all forces together into a compact, mobile, violently-reacting team to assure success on the battlefield. The program was designed for use on a quarterly basis to train each man to do his job and retrain each team, as time and resources would permit.

Air Cavalry Versus Attack Helicopter Units

Why should aerial gunnery for air cavalry units be any different from that conducted by attack helicopter units? A comparison of missions is helpful. Simply stated, air cavalry provides the eyes and ears required to locate the enemy, while the attack helicopter provides the muscle to destroy the enemy. Ostensibly, the mission of air cavalry is the same as that of ground cavalry units. However, the flexibility provided by the helicopter greatly expands and accelerates the conventional cavalry functions—reconnaissance, security, and economy of force operations. Air cavalry does not perform the heavy combat tasks associated with annihilating enemy forces. Therefore, any tanks they may kill will be done in the process of gathering information and developing a situation for the employment of major combat forces. Fundamentally, a realistic aerial gunner program must be structured differently to accomplish the tasks associated with the mission. Without doubt, air cavalry missions are more diverse than those of any other type aviation mission—and the training must accomondate this uniqueness.

Range Design

In designing a range complex for cavalry units where ground and aerial weapons could be fired simultaneously, many aspects were evaluated. Looking specifically at the considerations associated with Troop D's aerial gunnery, four primary aspects were evaluated:

- Size and shape of the impact area
- Accessibility of the range from the maneuver areas
- Size of the maneuver areas adjacent to the range
- Safety.

An evaluation of the size and shape of the impact area at Fort Carson revealed that all aerial weapons of the troop could be fired. The physical constraints of the area, combined with the joint use by aerial, ground direct-fire, and supporting indirect-fire weapons systems, dictated that "perimeter" firing lanes would be used.

Both the north-south and the east-west axes could be used. However, the north-south axis was generally favored for two reasons. First, Fort Carson officials want high-failing, dud-producing munitions, such as the 40-mm grenades fired from the *AH-1S* attack helicopter's turret, to be fired in designated areas. These areas were located on the northern end of the impact area. Second, the north-south axis complemented the squadron's training plan because the firing lanes for ground crews were also on the north end of the impact area. This enabled the aerial gunnery lanes to overlap the ground firing lanes.

The accessibility of the range complex from the maneuver areas was a key consideration. Unlike the ground cavalry troop, whose platoons are employed as mini-combined arms teams, Troop D is employed as a troop and must train that way. In this regard, the training area must be larger. To accomondate this requirement, all maneuver areas around the impact area were studied to find out how many areas could be used by the troop for staging and firing. The basic argument was that, if artillery units routinely staged and fired from areas not contiguous to an impact area, then why should aerial gunnery staging and firing areas be restricted. From the study, we found that all areas except the eastern area were favorable. Further, we were allowed to stage and operate our forward area refueling and rearming point (FARRP) from almost all available maneuver areas. Also, we were permitted to select firing positions which were outside the impact area but within 1 kilometer of the boundary.

The flexibility in selecting firing positions made the size of the maneuver areas adjacent to the range an important concern. This importance was felt in two ways. First, firing positions had to be many and varied to support a realistic training senario and thus challenge the crews. Second, the firing positions influenced the target locations and array within the impact area.

The safety aspect was concerned with the design and operation of the maneuver/range complex and with the constraints placed on realistic training. In the areas of design and operation, the major safety consideration was with flying "armed" helicopters between the tactical FARRP area and the firing lanes. This hazard was overcome by the use of a training Safety Control Plan. The only constraint which detracted from a realistic program was the restriction on being able to fire the turret-mounted 40-mm grenade launcher in only one area. The overall squadron approach to safety was simply to do the job correctly the first time.

The aerial gunnery range was part of a squadron firing complex and was designed to fit the needs of an integrated air-ground training environment. We evaluated the diverse terrain which was available for firing positions and created firing lanes. The lanes were marked by terrain features, panels, and painted tires and barrels. Firing positions were "clustered" into firing boxes corresponding to specific firing lanes. These two control measures enabled the flight crews to fire at targets within the lanes from various positions within the firing box. The only other control placed on the crews was an azimuth restriction to keep the munitions surface danger zones within the impact area. In short, the detailed selection of routes, firing positions, technique of engagement, and flight mode was left to the air crews. This freedom of action was guided by a tactical scenario which was presented ahead of time.

Benefits of the Program

After considering the why, scope, mission of cavalry, and range design, what benefits are derived to make the exercise worthwhile? Obvious benefits are derived from the realism of the training. Beyond this, the diversity of effort, maximum use of training time and land, and finally, the training performed is wholly measurable.

Realism is gained both from the way the training is conducted and from the training itself. In combat, the squadron headquarters would direct the air and ground battle. Therefore, the squadron Tactical Operation Center (TOC) is responsible for the entire training complex and effects coordination with higher headquarters (G-3 Range Division). All subordinate troops units submit "real" reports in accordance with the squadron Tactical Standing Operating Procedure (T-SOP). Both day and night operations are conducted which, required at 24-hour TOC operation at both squadron and troop units.

In the larger squadron exercise, Troop D is employed and treated as another maneuver cavalry unit. From the range design, Troop D was able to conduct tactical FARRP operations as a part of the aerial firing exercise. This enabled the troop to run all training from a tactical bivouac site to enhance the realism of the training. The arrangement allowed continual access between the FARRP and the range—even when artillery, mortar, and tactical air were being employed in the target area. This ease of movement further aided the training of tactical leaders by permitting them to request and employ a variety of weapons to fit the situation.

Another benefit of conducting the range firing from a tactical FARRP, as opposed to a "sterile" range operation, was that aircrews were required to think and not simply to react. They were required to select the proper terrain flight mode to reach firing positions. They had to determine which movement technique should be employed. Lastly, they had to evaluate the target area and determine how best to engage the "enemy" targets. During multiple aircraft exercises, the teams had to coordinate their firing positions with each other to get the best weapons effect on the targets. Behind the scenes at the FARRP, the supporting elements were busy doing their tasks and missions in a tactical, time-constrained environment.

The frequency of the aerial gunnery exercises provided an

opportunity to evaluate the entire troop's ability to accomplish its assigned missions in a tactical environment. The ability to move, shoot, and communicate is the key to any successful operation. The quarterly exercises provided the environment for aircraft and armament repairmen to gain a perspective of the amount of work required to keep aircraft flying in a "combat" situation. The importance of knowing and being able to use troubleshooting procedures, test equipment, and then in selecting and being able to use the proper tools to make repairs become evident. Further, all personnel learned the importance of "pacing" themselves in an extended operational situation.

The targets used provided a realistic picture. They were placed at ranges from 800 to 1,000 meters for turret targets and from 2,500 to 5,000 meters for rocket targets. Targets for the turret and *UH-1* helicopter door gunnery were "E-" type silhouettes attached to 55-gallon drums. The longer-range rocket targets were old trash dumpsters with Soviet vehicle silhouettes made from plywood attached to them. The extended range targets were selected from "scrap" targets which were already in place.

For the aero-reconnaissance assault course, "E"-type silhouettes on pop-up mechanisms were used. This added realism, prevented the usual "walk-n-shoot" syndrome, and required each squad/team leader to direct his unit's fires. Each leader had to select the proper weapon for the proper target. The area used by the aero-reconnaissance platoon was the same as that used by the other ground units for the squadron.

Command and control for the troop exercise was not coordinated from a tower but rather from a tactical command post in the maneuver area. Coordination with range control was effected through the squadron TOC. A safety/command and control aircraft was used to "oversee" but not to interfere, unless safety considerations required. This allowed decentralized control and execution of the firing. Thus the scout weapon teams could engage targets from any firing position as long as they did not fire out of the designated safety arcs. This fully enhanced realistic training.

Ammunition was stored at the squadron ammunition supply point and moved via troop vehicles to the FARRP as needed. The troop's ammunition handlers were exercised in their ability to inspect, maintain, and protect the munitions in a tactical environment. Fuel requirements were met in a similar way. Fuel handlers had to practice field refueling techniques as well. Since the FARRP was subject to moving on relatively short notice, the importance of keeping the area "picked up" was evident. Ammunition was unpacked as need.

Scoring procedures for firing included much more than how well the crews put "steel on the target." Scout crews were evaluated on their ability to provide information about the area of operation. All information—positive or negative—on trafficability, road conditions, and absence of enemy forces is vitally important. Furthermore, they were evaluated on their use of stealth to avoid enemy contact and their ability to gain knowledge of the enemy without being detected visually or electronically. Another responsibility of the scout crews was to plot all hazards to flight, such as wires, which were encountered in the area of operation.

We purposely did not construct the range in an area devoid of man-made hazards, because the battlefield will have them as well. Further, we did not use a tower for control because of the unreal aspect of it. The entire operation was designed to be as close to combat conditions as possible.

Conclusion

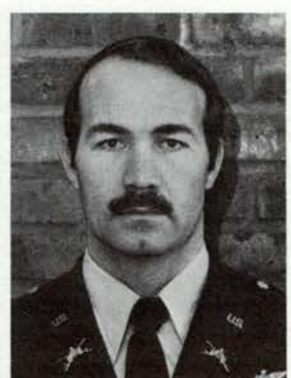
The expanded aerial gunnery program conducted by the 10th U.S. Cavalry is an excellent way to meet the requirements of training in a peacetime environment. The "Buffalo Soldiers" emphasize the air-ground team in all aspects—maneuver and live-fire—and conduct their training routinely on a quarterly basis. They take maximum advantage of a small training area and limited time. Their training is performance oriented and can readily measure the readiness posture of the unit in all areas required to ensure mission accomplishment.

This same training method can be adopted and applied by any combat maneuver-size force to enhance their training program. The point is to train the way we expect to fight. We must be prepared for the come-as-you-are war. Therefore, units must train with what they have now—people, equipment, time, and land. Battalions must train together in a comprehensive environment. Live-fire training should be conducted as the logical culmination of training and should be conducted frequently. This does not mean firing on the well-constructed, ideally-suited range complex only; but, rather, training the combined arms team in areas where leader and soldier alike are challenged.

Lack of available time and land are the two most common excuses for not training realistically. The training outlined in this article provides one way of overcoming these excuses. If leaders are interested in realistic and beneficial training in an environment restricted by size and time, it is recommended that they try the 10th U.S. Cavalry method or adjust it to meet their needs.

10th Cavalry

MAJOR GALE N. SMITH was commissioned from Infantry OCS in 1967, and later transferred to Armor. He has a Bachelor of Science degree in Political Science from the University of South Carolina. A graduate of the Defense Language Institute, Flight School, Armor Officer Advanced Course, and the Armed Forces Staff College, he has served as an armed helicopter platoon commander, brigade aviation officer, division aviation company executive officer, and commanded several companies. He is currently serving as an exchange officer with the British Army and is commanding an armored reconnaissance squadron of the Royal Horse Guards/1st Dragoons (The Blues and Royals), Household Cavalry.



A New Proposal for Fighting Vehicles

by Brigadier (Retired) Richard E. Simpkin

Several trends are converging to spark yet another skeptical glance at the Infantry Fighting Vehicle (IFV) concept. Ever since the *Bundeswehr* began to move NATO away from "battle taxis," the history of Mechanized Infantry Combat Vehicles (MICVs), IFVs or whatever has been among the least happy in the entire spectrum of defense hardware. Sweden and France got it more or less right; several minor league members on both sides of the Iron Curtain have not done too badly. But the Federal Republic of Germany's *Marder* adds up to what even many Germans admit to be an expensive monstrosity. The United States and the United Kingdom have so far failed to make first base, although the *M-2* IFV and Mechanized Combat Vehicle-80 (*MCV-80*) are coming along. Even the Soviets now seem to have boobed for once. Their *BMP* was formerly hailed as the dawn of a new era for the motor rifle arm. Now it has been partially replaced by *MT-LB*—seemingly a stopgap vehicle with obsolescent subsystems—in their forces facing NATO, while *BMP*s are seen alongside *T-54/55s* in Afghanistan. Could it just be that the concept is unsound?

Then the advent of compound armor[1] has placed a large question mark over surface-delivered chemical energy attack against the Main Battle Tank's (MBT's) frontal arc. Like all advances, this is no more than a swing; but it is a big one and sets a limit on the value of hand-held weapon systems and current sizes of ATGMs in the main battle. This gap badly needs to be filled by kinetic-energy (KE) antitank weapon systems and puts an even higher premium on tank gun performance.

Fact is, the United States and maybe most everyone except the Bundeswehr and the British Army is beginning to see the new MBTs like *Abrams* and *Leopard 2*, certainly *Chieftain*, and maybe *T-72*, as tank destroyers in tank's clothing. It looks like the MBT concept may have been valid only for a certain state of the art—that which was embodied in *Centurion*, *T-54/55*, *M-60*, and *Leopard 1*. Projects like High Mobility-Agility (HIMAG) and High Speed Test Vehicle-Lightweight (HSTV-L) show just how hard the U.S. Army is looking at a "hi-lo" armored vehicle profile (large caliber gun on a light armored vehicle) as a complement—maybe ultimately a successor—to the MBT. This is a question I have addressed in a book now in press[2] and hope to return to later in these columns.

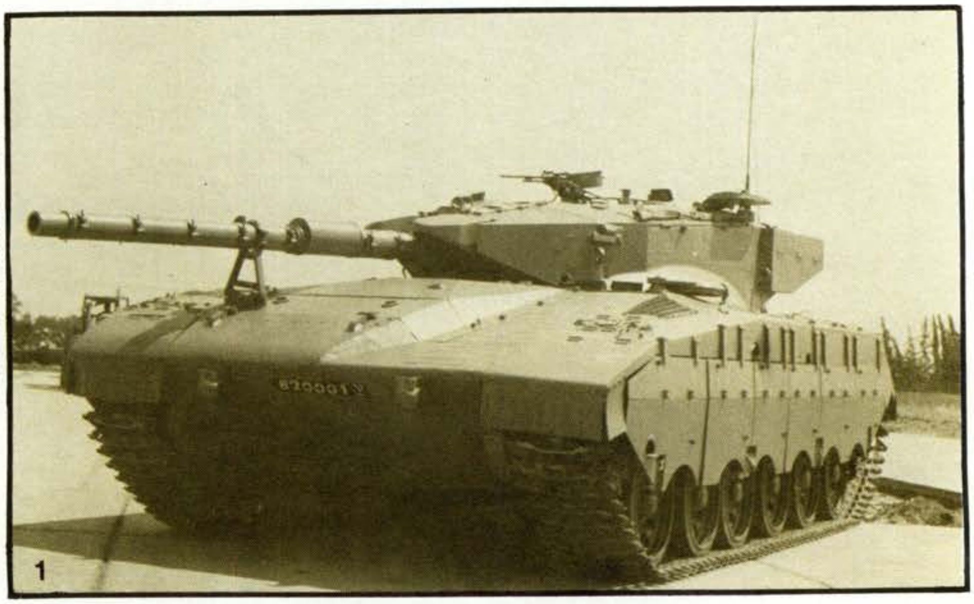
Then again the geopolitical situation has destablized. Even the highest-priced crystal balls are getting hit out of the ballpark almost before they leave the pitcher's hand. The United States and her allies have to do more than just rerun the well-worn NATO Center film. At least four situations are on the bubble. Any of them could result in a clash of arms between the U.S.—hopefully supported by her main NATO allies—and the U.S.S.R. in a wide variety of climates and types of terrain. Looking a development cycle ahead, I also see a scenario in which NATO and the Warsaw Pact might face south side by side to counter one of a number of threats which are beginning to take on a discernibly and uncomfortably physical shape. Like its predecessors of the fifties and sixties, hardware that is now a twinkle in the designer's eye, or a test rig on a proving ground, will need to be versatile, well-balanced, and efficient in engineering terms.

Ever since I first got to know the MICV concept in 1968, my reaction to it has been "So what?"—a view widely shared, I think, by operational analysts and defense financiers on both sides of the Atlantic and the English Channel, not to mention many Anglo-Saxon users.

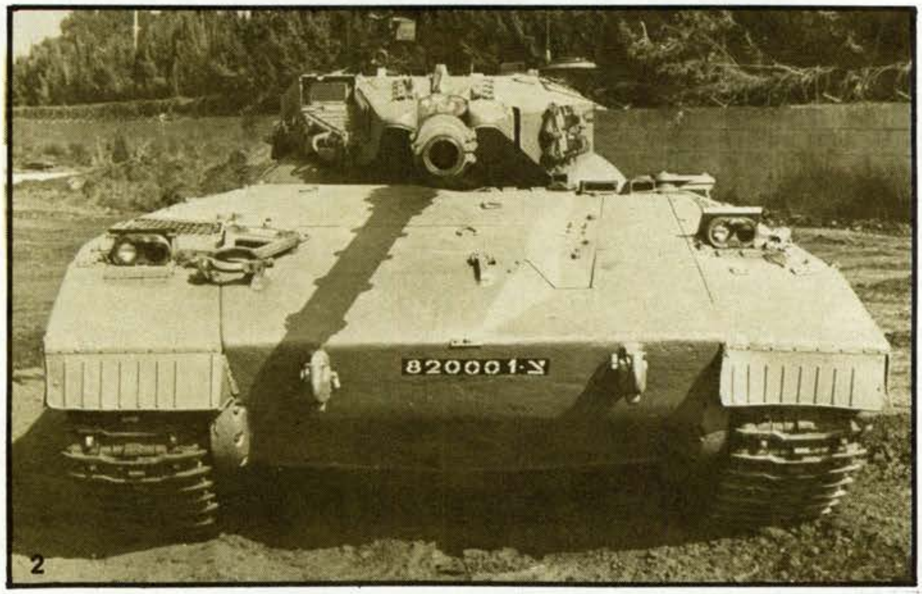
Nobody, except seemingly the British with *MCV-80*, still sees an IFV as the parent vehicle of a cost-effective workhorse family. Sure, the notion of going the other way to an IFV bas-

Israeli *Merkava*. The most familiar view of *Merkava* (photo 1) shows the design at its worst. Note small turret frontal aspect (photo 2) and rear doors (photo 3). The compartment takes 6 men in comfort but might well be used for reserve fuel/ammunition or, say, explosive stores.

(Photos from the Israeli Defense Ministry.)



1



2


3

ed on the MBT hull is mind-blowing, but a little ballpark figuring with the aid of U.S. and German published figures suggests that, even ignoring any payoff in effectiveness, a switch from *Marder* or the late *XM-723* to a tank-based IFV would increase the system unit cost by only 20 percent on a fleet size of 1,000.[3] But this 20 percent is 20 percent of a lot, and the West's conventional wisdom long regarded mounting a tanklike gun on an IFV as not just unfeasible, more like actively indecent. So the hermaphrodite *Merkava* never really happened—until it did, when it was greeted with scorn. On published figures and deductions from them, *Merkava* ranks with *Chieftain* on mobility ("No speed, please, we're British!"). But General Tal's vigorous reaction to assumptions like this, coupled with known Israeli ideas on tempo and the movement of masses, make me at least think the truth could be different.

Likewise *Merkava* looks like not just a hermaphrodite but a pregnant one--until you realize that the turret has been slimmed right down so that its frontal aspect is less than 1 meter[2] and its side more like *T-72* than *Leopard 2* or *Abrams*. Sure, *Merkava's* design balance may be high on firepower for an IFV in European conditions; and the idea of an MBT as such carrying infantry is questionable. But with its 105-mm gun, excellent protection and a maneuver squad of 6, *Merkava* proves its feasibility.

I hope I will not be accused of nostalgia when I remark that the 105-mm gun is not a weapon to be dismissed lightly, specially since U.S. work on its KE ammunition has given the 105-mm gun a new lease on life. While a new tank should always have good upgunning potential, the series of decoupled long rod projectiles culminating in the *XM-833* make the military reasons for switching to the smoothbore 120-mm in *Abrams* look even more marginal than they did at the moment of decision.

So, put a 1,450-1,500 brake horsepower (bhp) powerplant in a *Merkava* configuration, and you have a vehicle that at least matches the West's latest MBTs in mobility and survivability. Additionally, for some tradeoff of antitank firepower, it maintains the optimal high-explosive plastic/high-explosive (HEP/HE) caliber for the fire support role and takes a maneuver squad, albeit a small one. The "MBT" or "gun tank" member of the pair can then be optimized as a tank destroyer (TD). Given the balanced tank-infantry groupings most now prefer, this move almost doubles KE antitank capability for a cost slice increase of 20-25 percent. We will return in a moment to the tactical and organizational aspects of this solution.

Just now though, with long sea voyages and long external lines over undeveloped territory creeping back into the scenarios of high-intensity operations, nobody from user to financier is going to welcome doubling the number of agile monsters with a thirst to match. This cuts right across the trend towards a "hi-lo" profile. But it so happens that work now fairly well advanced in the United States and Sweden could be combined to do away with the dinosaurs, provide an IFV with KE antitank capability and, more broadly, offer a real chance of clawing back the Soviet lead in armored vehicles.

The breaks I mean are the Defense Advanced Research Projects Agency (DARPA)/ARES gun and the Swedish one-man turret. We might take the gun first. The DARPA (then ARPA) project started with a long-rod, armor-piercing, discarding-sabot, fin-stabilized (APDSFS) projectile for the 105-mm and then split. In the 105-mm caliber, development moved through the *M-735* round to *M-774* (type classified mid-1980) and *XM-833*. In parallel with this approach, the team applied the parameters established with the 105-mm to the design of an optimized KE antitank gun. This came out at 75-mm caliber—the long gun with an intermediate tube bearing now mounted on the HIMAG and HSTV-L test rigs. However, assessments of the Soviet "beyond," *T-82* or whatever, suggest that the developers may have to come again with a caliber around 90-mm, probably the optimum for an accurately delivered conventional HE shell.[4]

Yet, the largest data available to me suggest a more attractive solution still, doubly so when account is taken of real costs and logistics. This is to mount the standard NATO 105-mm gun of 51L[5] on a fire support tank/infantry fighting vehicle (FST/IFV), firing *XM-833* (or a successor) and the long-established 105-mm explosive rounds.

At this point, we need to do a little more ballpark figuring. The Swedish version of the 105-mm gun has a 62L tube (as against the standard 51L); a reduction of loading length of 450 mm (scaled from the standard 105-mm APDM and the 75-mm ARES APDSFS) would allow this to be increased to say 68L. Given modern power train parameters, one may safely assume that any future fixed gun design would have one more roadwheel station than the *S-Tank*, so we could be looking at a "super 105-mm" with shot travel of 72-75L[6] and a total charge weight comparable with that of conventional 120-mm tank guns. This weapon might pack a rather remarkable punch and have mounting parameters similar to a 120-mm smoothbore.

With "the long and the short of it" thus in mind, we need to turn to the options for the concept study stage of Sweden's *S-Tank* successor program. One of these is a straight evolution of *S-Tank*, mounting a 120-mm gun. The other front runner, which could be an alternative or part of a mix, would mount the same gun externally over a one-man turret. The test vehicle for this is in fact a *Marder* hull with the NATO (51L) 105-mm gun. The commander will have a stabilized cupola right front, sensors of optic/electronic systems providing the equivalent of conventional sighting, and all-around vision systems will be mounted on top of the gun housing.

Age has evidently failed to dull the twinkle in Sven Berge's eye. Just in terms of the MBT role, this is a superbly intelligent approach because it brings the vehicles below *T-72* weight without trading off fighting power or habitability. The respective drawbacks of hiving off, top traverse, and the commander's superior position are largely complementary, and would thus be largely offset by a low-level mix of these options.

But for the moment I want to pull two specific points out of this program. The Swedes seldom get their homework wrong; if the hull of the 26-ton *Marder* will take the standard 105-mm in this configuration, the hull of a 40-ton (or less) *S-Tank* successor would do so with capacity to spare. Second, as I hope I demonstrated above, the 120-mm gun proposed for the tank destroyer (TD) option could just as well be a "super 105-mm". Figure 1 shows how the one-man turret could provide the key to a 40-ton (or less) Fire Support Tank (FST)/IFV, again with a reduced maneuver squad.

In terms of hardware, procurement and logitics, this approach is radical but not revolutionary. In place of a 55-t MBT and a 20-t (or greater) IFV (out on a limb because it is too big for workhorse roles), you have a 40-t (or less) TD and a match-

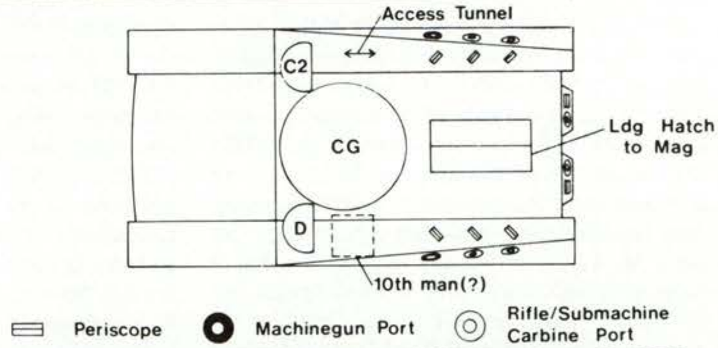
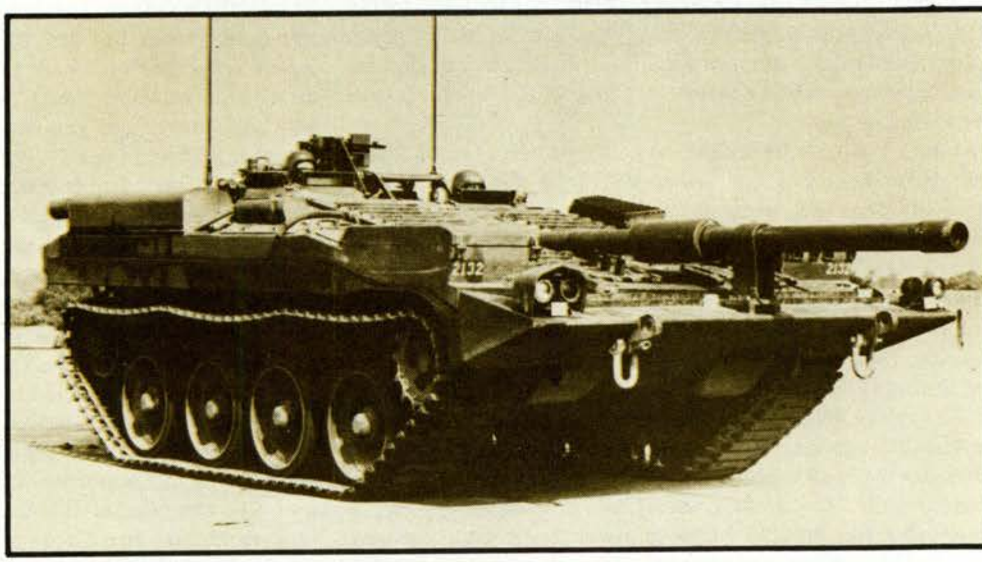


Figure 1. ***Schematic of 'support tank' (IFV) based on a 40 t MBT (e.g. S-Tank).*** **CG = commander/gun (and overall commander), C2 = maneuver team commander, D = driver. A tenth man could probably be carried behind the driver. Replenishment of an on-gun ready magazine could be either manual via a roof hatch (as shown (or automatic from a jettisonable main magazine mounted above the rear compartment roof. (Reproduced from *Mechanized Infantry*, by kind permission of the publishers.)**

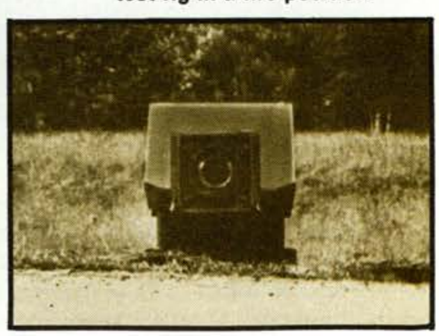


Swedish *S-Tank*

(Forsvarets Materielverk Stockholm.)

The standard NATO 105 mm-gun on a *Marder* hull provides a test rig for a 120-mm on a 35-40 t vehicle.

The Swedish *Marder*/105-mm test rig in a fire position.



ing FST/IFV with common ammunition and fuel, and maybe 75 percent commonality of spares—plus a basic, economic workhorse in the 10-t (more or less) class. But because this machine bridges the traditional armor-infantry divide, the tactical and organizational implications are not entirely negligible.

Here we need to address three points. Believing the present situation to be one which calls for the adjustment of military thinking to newly available technology, I probed the equipment side in some depth. So I must keep the military arguments brief here, although I have rehearsed them exhaustively elsewhere. Anyways, most readers of ***ARMOR*** will want to think these aspects through for themselves.

The most real and important question is the size of the maneuver squad. The need for the conventional size squad stems from the requirement to carry squad weapons like a machinegun and/or a rocket launcher and the ammunition for them. The firepower of modern individual weapons reduces the need for squad weapons, and I doubt whether the maneuver squad has to carry such weapons on the man when working intimately with tanks. Second, I have been privileged to work in operations and training with British Paratroops and Marine Commandos and with the United States Marines. It always struck me how two or three determined, fit men who patently know why they are there and leave nobody else in any doubt of it achieve as much as a full infantry squad at considerably less risk to themselves. I accept this comment does not hold for positional operations; but working with tanks is hopefully not positional. In sum, I suggest 1 + 6 is enough.

Next, I want to pitch in the view that the divide between armor and mechanized infantry is an unfortunate accident of history. Nobody questions that tanks need *Hausinfanterie*; but whichever way one comes at the question, reasoned argument ignoring current force structures leads him inexorably to a composite maneuver unit with an even balance of mounted and dismountable elements organic to it. Of the major armies, the United States and British have come nearest to this pattern. From the late forties up to the implementation of Reorganization Objective Army Divisions (ROAD) in 1963, Fort Knox had proponency for "armored infantry." At this time, the U.S. Cavalry, although closely associated with heavy armor, was still a distinct entity—as of course was the Infantry. Nobody could deny the soundness of the 1963 decision given the doctrine of the time and the "battle taxi" concept which culminated in the *M-113.* At the same time, cavalry and tanks merged to form U.S. Armor. But both theses moves look far less happy now, against an armored threat markedly upgraded in firepower and speed or against the current and foreseeable states of the art.

In Britain it was financial stringency that almost produced an ideal force structure for the eighties. In the fifties, the true cavalry role was still confined to the handful of "armoured car regiments." In one of the squeezes, it was proposed to incorporate the group of regiments which provided the "Motor battalions" (now fused as the Royal Green Jackets) into the Royal Armoured Corps (along incidentally with the Royal Horse Artillery).

This elitist solution would have provided the force structure of cavalry/armor (composite)/infantry which the U.S. Army had up to 1963 and which now looks right again. In the event, egalitarianism won. The reconnaissance and tank roles are now rotated throughtout the Royal Armoured Corps, and the mechanized infantry role throughout the infantry. On the credit side, though, these squeezes also produced the "square" tank-infantry groupings which have, I believe, done much to prove the tactical power of balanced combat teams.

Quite apart from improving operational effectiveness, this radical change in force structure would I suggest achieve four things. By broadening the base, it would ease the selection of turret crewmen. By putting men on their feet right into the armored platoon, it would both provide a real and cost-effective place there for short-service soldiers and draftees and ease the all-chiefs no-Indians problem which bugs every armored unit at grassroots level in garrison and in the field. Last, but not least, it would produce real tank-infantry cooperation.

To sum up, we approach the turn of the century with scenarios and technologies which combine to favor a force structure of three direct-fire combat arms in place of two—cavalry, with its traditional roles plus an airportable punch; armor, with one kind of balanced composite unit forming the entire main maneuver force; and infantry, not "mechanized", but surely equipped with a light, basic squad armored personnel carrier as inevitably as it now has trucks. By contrast we need to rationalize the number of armored vehicle families from three or even four to two—a 40-t (or less) class (like HIMAG) based on matching TD and FST/IFV pair and providing a platform for the heavy support vehicles of the mechanized force; and subsystems for vehicles ranging from 8-t to 12-t (around the HSTV-L mark) to mount the cavalry's eyes, ears, and fist; to carry the combat subunits of the standard infantry battalion; and to cover the span of workhorse roles.

Footnotes

[1]I.e. special armor, Chobham armor, *Schottpanzerung*, (Soviet) combined armor.
[2]*Antitank* commissioned by Brassey's/Pergamon for publication Spring 1981.
[3]By "system unit cost," I mean *total real system cost* per production unit, a much higher figure than "unit cost". The quantitative requirement for *XM-723* was 1250.
[4]This is the "88-mm" gun I postulated in both *Tank Warfare* and *Mechanized Infantry*.
[5]L [5] "caliber-lengths" shot travel/caliber.
[6]On my scaling from published schematics, the ARES 75-mm is around the 72-L mark.

RICHARD SIMPKIN joined the Royal Tank Regiment (British) in 1940, and saw service in the Middle East. He graduated from Staff College in 1951, and the Royal Military College of Science in 1953, specializing in vehicles. He was responsible for user trials of the *Chieftain,* and worked with the *Scorpion* and *Swingfire* development. He was promoted Brigadier in 1968 and placed in charge of equipment policy for the direct-fire battle and all aspects of mobility. He headed the British team on the project definition and operational requirements of the Anglo-German MBT program, where he was closely concerned with the exploitation of Chobham armor. After retiring he set up a language consultancy in 1971, and divides his time between that and writing books.

China's Armored Force

by Mark Urban

The role of China's Armored Forces, now and in the future, is critical, no matter where threats to China's security orginate. It is often reported that Chinese tactics, organization, and equipment closely follow the Soviet pattern, but in the case of the armored forces, this is less pronounced.

Although most Chinese equipment is copied directly from Soviet examples, only one of the four most important armored vehicles is derived from a Soviet model. That one is the *T-59* tank which is a copy of the Soviets' *T-54/55*.

As for doctrine, the Chinese concept approximates Soviet doctrine of the Great Patriotic War, not Soviet thinking of today. Tanks are often used by the Chinese as little more than self-propelled artillery, with high explosive (HE) being the only round carried when used in that role. China is alone in the world today in having divisions of antitank guns and horse cavalry.

This stagnation on the part of the Chinese may be a result of the strict adherence to the Maoist doctrine of protracted guerilla war during the 1950's and 1960's. In this role, the tank, even if available, is often more of a hinderance than a help, i.e., in a mountainous area. The armored theoreticians within the Chinese Army must surely have had a full-time job justifying their existence, let alone attempting to modernize or expand their forces.

Most observers would name the Soviet Union as the principle threat to China's future. In the long term, this is probably true, but it is not necessarily true in the short term. If we accept that there are 46 Soviet divisions in the Russian Military Districts bordering the People's Republic, (which is not the same as saying that they are on the Sino-Soviet border itself, because the distances involved in Siberia are vast), we should realize that many of these divisions are not at full strength, with some having perhaps 20 percent of full strength. Within the next few years, a Soviet attack would be a suicidal move. On the other hand, there is some evidence that they themselves fear attack. There are reports that the Russians have been emplacing old tank turrets and building other static defenses around Novosibirsk and other Far Eastern settlements.

Manpower

The main Chinese forces consists of 115 infantry divisions, 40 artillery divisions, 16 railway and construction divi-

sions, and only 11 armored divisions. When the 100 local force divisions are added in, it is evident that the Tank Corps is of relatively small importance because it numbers only 100,000 out of an army of 3,600,000.

The Tank Corps is commanded by Hsin-Ting Huang who is considered to be equivalent in rank to a Western World lieutenant general. Theoretically, there is no rank structure in the Chinese Army. In addition to the armored divisions, there are armored battalions and regiments that are often, but not always, attached to infantry divisions. Armored companies and battalions are also attached to border troop units on occasion.

The training and morale is perhaps the most important factor in any consideration of the capabilities of Chinese tank troops. The Chinese soldier is an extremely tough and brave individual—the Korean war proved that. Evidently, any failings of the Chinese military system have been carefully screened out of the Chinese press, which presents a picture of virtual political robots that somehow have the good sense to support whichever poltical faction is in the ascendency. The personal rivalries and ideological conflicts of China's rulers often confuse "China-watchers" in the West's most august academic institutions, so we might ask whether the troops in China's more far-flung garrisons really know what is going on. Surely, there are some lingering hatreds among China's many ethnic minorities. The Vietnamese mock Chinese soldiers, calling them stupid and illiterate, but then the Vietnamese are hardly impartial observers.

Evidently, China lacks sophisticated training facilities and equipment. The Vietnam-U.S. war might have shown that stubborn, motivated troops can defeat a technologically superior enemy, but any conflict between China and the Soviet Union, or indeed Vietnam, would be quite different. The armored forces are regarded by the Chinese as something of an elite, and they receive better manpower, equipment, and training than infantry units.

Deployment and Organization

Of the 11 armored divisions, 6 are in the Shenyang and Peking Military Regions (MR), 2 are in the Sinkiang MR, and one is probably in the Langchou MR. The remaining divisions are either held in strategic reserve in Wuhan MR or on the Vietnamese border.

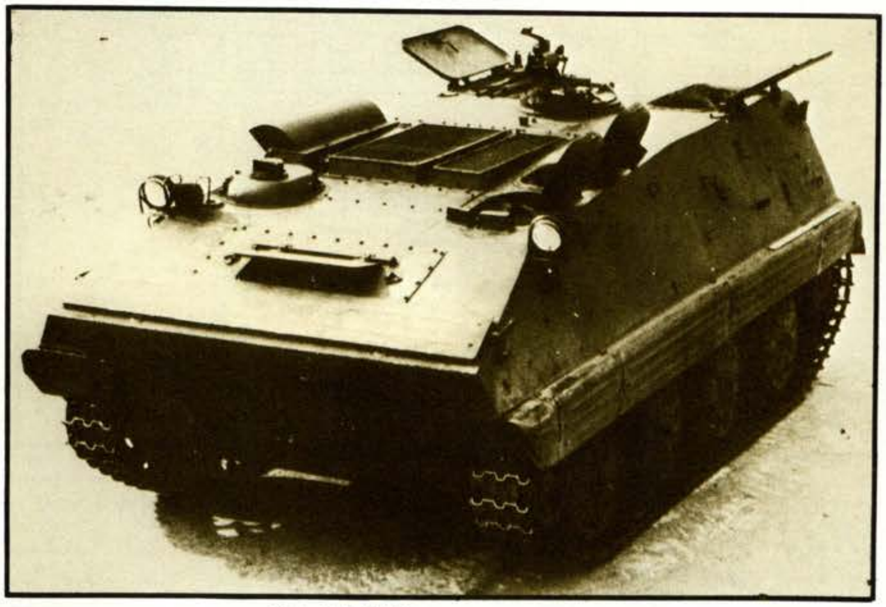
Each armored division is organized into 1 mechanized and 3 armored regiments with an artillery regiment in support. The air defense battalion is equipped with twelve 14.5-mm antiaircraft (AA) machineguns and 15 twin 37-mm or 57-mm guns. (These may be twin 37-mm guns mounted on T-34 chassis.)

This represents an inadequate amount of defense against modern attack aircraft.

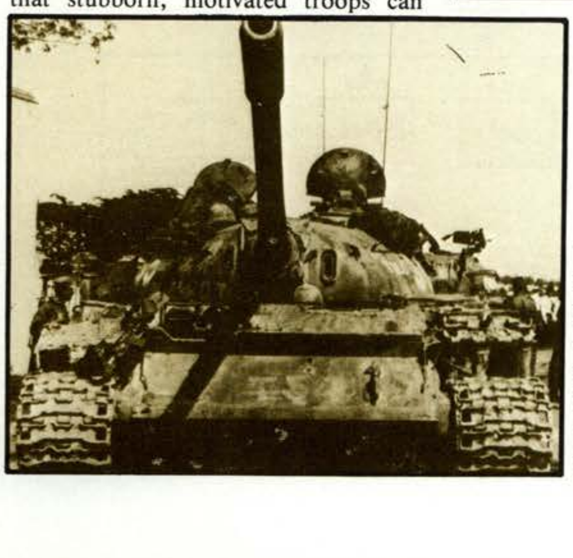
The mechanized regiment does not have enough armored carriers (APCs) to transport all of its personnel. Indeed, in the assault, much of the mechanized regiment has to ride on the tanks, surely a very costly procedure. The tank battalion of the infantry division has 31 medium tanks and 10 assault guns. When added to an entire division, their contribution would hardly be decisive.

The antitank gun divisions are grouped into four regiments with an air defense battalion and other support units. The location of these divisions is not clear, but they are probably in the northeast part of China. The Chinese are known to have a fondness for massed antitank guns, and this perhaps is the greatest unknown quantity in the Chinese antitank defenses.

Whatever their deficiencies, these tank forces remain vital to the Peoples Liberation Army. The forces are used to:



The *K-63* APC (formerly known as the *M-1967* is the PLA's principal armored personnel carrier. About 1,500 are believed to be in service.



The *T-59* is the best-known and most widely used tank in the Chinese Armored Force. It is a copy of the Russian T-54/55 and its 100-mm gun is the largest in service with PLA units.

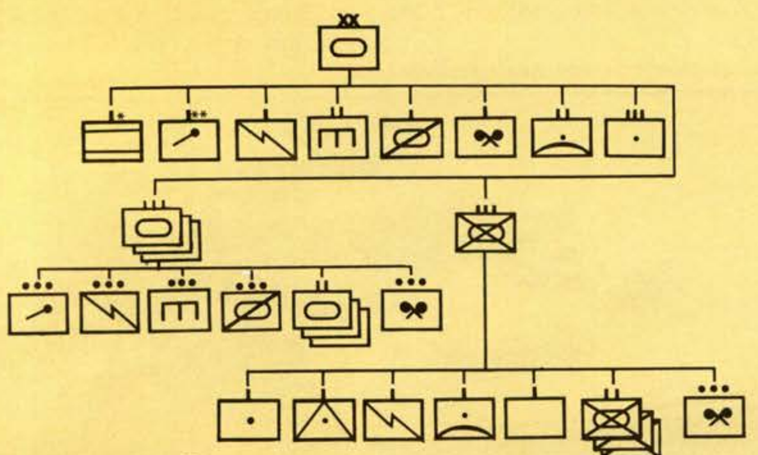
- Stiffen defenses
- Initiate counteroffensive operations
- Close breaches in defenses
- Defeat flanking movements

Equipment

The *T-59* is the best known and the most widely used tank in PLA service. Its 100-mm gun remains the largest caliber tank gun in Chinese service. This vehicle has seen battle on several occasions, acquitting itself moderately well.

An interesting development by the Chinese during the 1979 war with the Vietnamese was the use of *T-59s* without turrets as APCs. These vehicles were

The Chinese *T-63* features a hull similar to that of the Russian *PT-76*. It is equipped with a T-59 engine, and the rounded turret mounts a 85-mm gun and a 12.7-mm machinegun.



*Headquarters element
**Security element

Figure 1

armed with 12.7-mm machineguns. This could illustrate the shortage of APCs in the PLA, but tanks are scarce as well, so why this expensive measure?

The days of the *T-59* as China's main battle tank must be numbered. A new vehicle must be on its way into production, if it is not already in service. It might be based on the Soviet *T-62*, examples of which were obtained in border fighting and from Egypt. The possibility of retrofitting Western technology to existing tanks to extend their useful life might also be under consideration. The Hong Kong-based magazine "CON-

Armored battalion of an infantry division.

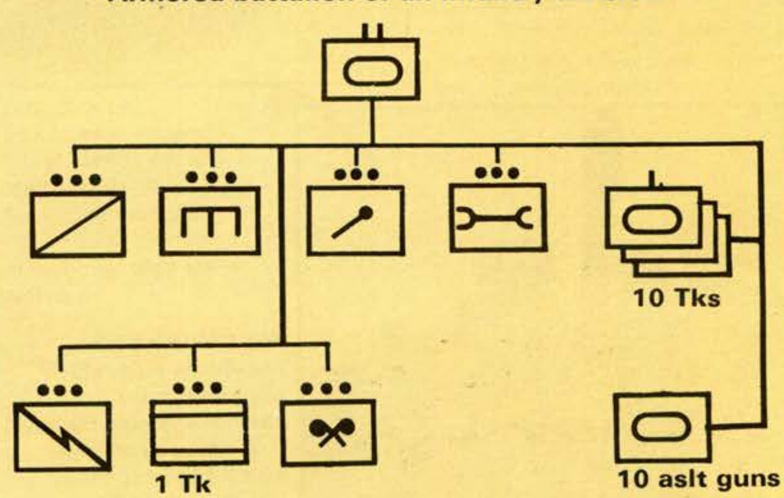


Figure 2

Characteristics of Principle Chinese Armored Vehicles

	T-59	*T-62*	*T-60/63*	*K-63*
Weight	**36 tons**	**20 tons**	**18 tons**	**12 tons**
Hull length	**6.2 m**	**5.7 m**	**6.91 m**	**5.54 m**
Height (less MG)	**2.40 m**	**2.3 m**	**2.19 m**	**2.10 m**
Width	**3.27 m**	**3.0 m**	**3.1 m**	**2.95 m**
Track width	**0.58 m**	**0.36 m**	**0.36 m**	**0.36 m**
Crew	**4**	**4**	**4**	**3 + 10**
Armor	**100-170mm**	**20-30mm**	**10-14mm**	**10-15mm**
Armament (main)	**100-mm**	**85-mm**	**85-mm**	**12.7-mm**
Rounds carried	**34**	**40**	**56**	
Armour penetration of primary AT round at 1000 m	**380mm**	**120mm**	**120mm**	
Secondary armament	**12.7-mm AAMG 7.62-mm Coax**	**12.7-mm AAMG 7.62-mm**	**12.7-mm AAMG 7.62-mm**	
Max. speed (road) Km/hr	**50**	**40**	**40**	**45**
Max. range Km	**500**	**500**	**400**	**450**
Night Vision aids	**Yes**	**No**	**No**	**Yes**
Amphibious	**No**	**No**	**Yes**	**Yes**
In use:	**China Pakistan Albania Vietnam Congo North Korea**	**China Zaire Albania Tanzania Sudan Congo**	**China Pakistan Vietnam Tanzania Sudan**	**China Albania Vietnam Tanzania North Korea**

MG—machine gun AAMG—antiaircraft machinegun AT—antitank

MILIT" recently published a picture of a *T-59* with what appeared to be a laser rangefinder above the gun.

The *T-63* is a redesigned version of the *T-60,* which was based on the Russian *PT-76.* The *T-63* features a hull similar to the *PT-76,* although with a *T-59* engine, and a rounded turret with a 85-mm gun and a 12.7-mm AA machinegun. Because of its amphibious capabilities, the vehicle is probably in service with reconnaissance units, although its use in the infantry division tank battalions should not be discounted.

The Chinese *T-62* light tank uses the same armament as the *T-63,* and a scaled-down *T-59* hull. The lack of an up-to-date armor-defeating round for this gun must surely limit its chances against a modern tank. The *T-62,* which was used extensively in the 1979 conflict with Vietnam, is a light tank in the truest sense. It is used to equip armored units in the south of the country where the terrain makes the going too difficult for larger tanks.

Some real museum-piece tanks may be still in service in the more forgotten provinces. The Soviet *T-34* is probably the most widespread, but an increasing number of these are probably being converted into AA guns, recovery vehicles, and other special roles. Some Japanese vehicles of World War II-vintage may also survive.

The Soviet *SU-76* and *SU-100* assault guns remain in service.

The *K-63* APC (formerly known as the *M-1967*) is the principal vehicle of note. Owing almost nothing to Soviet design, the vehicle accommodates four crew members and 10 infantrymen in a well-shaped hull. The vehicle is combat-proven, and apparently well suited to Chinese needs. However, production is limited, with perhaps 1,500 vehicles in service. It is apparently produced at a slow rate, and spares are hard to come by. The vehicle is not deployed exclusively with the armored divisions, which leads to speculation as to how and where else it is used. They are deployed predominately in the north, and very few were seen in the Vietnamese campaign.

Other APCs, derivations of various Soviet models, are still in service. Their deployment is piecemeal, with no general pattern. These include the *T-55* (Soviet *BTR-40*); the *T-56 (BTR-152);* and Soviet *BTR-50s* and *BTR-60s.*

The Future

Problems of incredible proportions await any Chinese leader seeking to modernize the Armored Forces. Importing foreign tanks is not the answer, for surely no country could provide the number required. (To reequip existing formations would require 8,000-10,000 tanks.) Equipping even the elite armored divisions with expensive foreign tanks would also pose insurmountable problems with maintenance.

The solution seems to be in the local production of a new vehicle, perhaps incorporating certain foreign and Chinese technological innovations. Tank production is currently concentrated at two plants in Mukden, and apparently production rates are low. Building new production plants and forming new units is obviously a very expensive business, and the Armored Forces will face competition from other arms if it is to take a share of any increased defense budget.

In doctrine, equipment, and battle drill, the Chinese Armored Forces are extremely primitive, compared with NATO and Warsaw Pact forces. Tanks are not suited to much of the terrain, so attempts to improve the infantry divisions must surely take priority, despite the presence of relatively large tank concentrations on the Sino-Soviet border. The Chinese Armored Forces, it seems, must remain too small to stem any Russian *Blitzkrieg,* and yet too large to be modernized quickly.

(The data and opinions expressed in this article are those of the author, and publication in no way implies endorsement by the Department of Defense. Ed.)

SECOND LIEUTENANT MARK URBAN served in the 4th Royal Tank Regiment and is currently an officer in the (British) Territorial Army. He is a student of International Relations at the London School of Economics.

GS Maintenance Forward

by Captain Douglas R. Boulter

As we fight the first battle of the next war on the terrain board, sand table, CAMS or COMBAT map, we watch the eventual attrition of our forces due to hostile fire or simple breakdown. Often, as if by magic, replacement vehicles appear on the board or major repairs are made by "higher" and the vehicle goes back into action. In real life, however, healthy skepticism leads us to question how this might happen.

The five *M-88* recovery vehicles in an armor battalion would seem to have their work cut out for them making short evacuations of damaged vehicles and pulling packs. Organizational and direct support maintenance units have limited capability for repairing battle damage and in any case would probably have more work than they could handle. Where does the help come from to work the war game magic in real life?

Realizing the maintenance need, the Department of the Army has developed an idea to bring more maintenace power into the battle area and have it responsive to the maneuver units. General support maintenace units will be given a new organization and mission to fulfill this function. Restructured General Support (RGS) will have two different features. First, RGS units will fix forward rather than in the rear of the corps area whenever possible. Second, these units will be weapons-system oriented. Each corps will have a combat vehicle support battalion which will work exclusively on the automotive, armament, and communications systems on armor, infantry and artillery fighting vehicles.

RGS organization envisions the combat vehicle support battalion being composed of two tank repair companies, a light armor repair company, and an artillery repair company (figure 1). The Battle Damage Assessment Section (BDAS) serves as the eyes and ears of the battalion in the forward area. BDAS inspectors go forward in the battle area to determine what can be fixed and whether the vehicle must be evacuated to one of the maintenance company locations or can be repaired on site. The Material Support and Evacuation Company will operate the General Support (GS) and Direct Exchange (DX) points and the cannibalization points; it will evactuate damaged combat vehicles and return repaired vehicles to the battle areas.

Does this sound too good to be true? In fact, the nucleus of such a battalion exists at Fort Hood, Texas in the 13th Corps Support Command (COSCOM). The Armor Support Battalion (ASB) provides GS repair and overhaul to the 1st Cavalry and 2d Armored Divisions for *M-60* series vehicles, *M-88* recovery vehicles, combat engineer vehicles, armored vehicle-launched bridges, and *M-551s*. Composed of the 190th Maintenance Company (Heavy Equipment GS), the 96th Transportation Company (Heavy Truck), and a Headquarters and Headquarters Detachment, this is the first Army unit organized under the RGS concept.

The battalion was tested by the U.S. Army Training and Doctrine Command Combat Arms Test Activity from January to October 1977 and has participated in many major field exercises. The concept has worked. General support has been rendered to task forces at their field trains and combat trains locations.

The organization of the ASB is as shown in figure 2. The 190th was originally a standard heavy equipment maintenance company reorganized as shown to work on the tank family of vehicles. The 96th Transportation Company contains 24 Heavy Equipment Transporters (HETs) and is augmented by the two HET's from the 190th.

The BDAS is the heart of the ASB. The BDAS is made up of highly skilled inspectors who do initial technical inspections and perform quality control on the work of the maintenance company in a manner similar to that of the inspection section of a DS Company. Here the similarity ends. The BDAS is run by an officer (in this case an armor officer) who is a special staff officer working for the battalion commander. In a combat situation, the BDAS officer will control the employment of all the battalion's maintenance and recovery assets forward in the corps area. He will provide armor units with a direct link to their GS support through his inspectors.

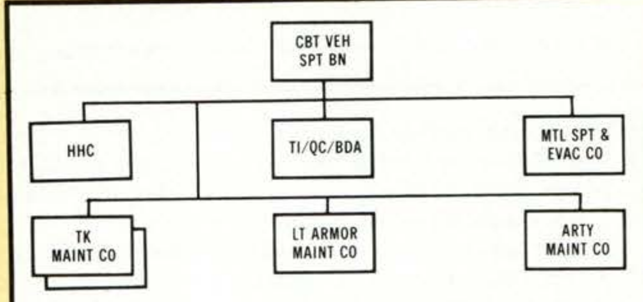


Figure 1.

The BDAS officer will commit an inspector team to each brigade Forward Area Support Team (FAST) in the corps. The team will consist of an automotive and an armament inspector, each of whom will bring with him little more than his tool box and his expertise. They will insure concurrent inspections of broken or damaged equipment with DS inspectors, decide on the level of repair, who will do the work, and whether it can be done forward. If it was decided that GS personnel should do the work, mechanics from the maintenance company will be called forward with the necessary tools and parts. If evacuation is necessary, the inspectors can commit one of the 26 heavy equipment transporters of the 96th Transportation Company.

This concept was employed during BRAVE SHIELD 19 at Fort Hood in April 1979. The battalion maintenance platoons of the maneuver task forces were satellited around the FAST where the DS company was located. BDAS pesonnel established contact with the DS unit and moved from one task force trains location to another continuously, inspecting all tanks evacuated from the battle areas. Occasionally, a simple loss of power was diagnosed as clogged fuel filters and the unit performed the repair. Sometimes the loss of power stemmed from bad injectors, turbos, or injector pump couplings. When DS could not perform the repair due to an excessive workload, GS

personnel were utilized to handle the overflow. HETs were used to return vehicles rapidly to the battle areas.

This concept eliminated a repair backlog. Tanks were inspected and repaired as soon as they arrived at the field trains almost on an assembly line basis. By moving from one trains location to the other, BDAS personnel were aware of the maintenance situation for the entire brigade. Time and money were saved by repairing rather than replacing engines. The only work that could not be done forward was repair of internal engine damage which comprised about 5-10 percent of the problems encountered on this exercise.

In addition to these inspector teams, the BDAS officer has two addditional teams which can be inserted wherever the greatest maintenance effort is needed. With his chief inspector, the BDAS officer can move throughout the corps area, insuring that the optimum employment of GS maintenance and recovery is achieved. Back in the rear with the maintenance company, the automotive and armament technicians will be supervising the work of making one good tank out of several bad ones and cannibalizing severely damaged tanks, as well as insuring that the proper personnel and repair parts are dispatched forward.

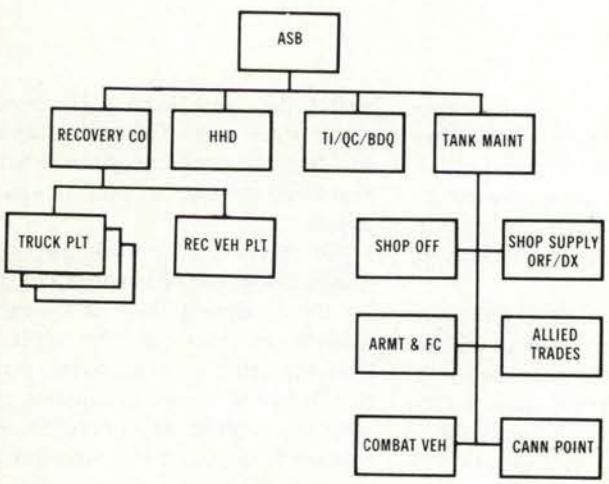


Figure 2.

Of course, many factors will affect the employment of the BDAS, GS mechanics, and recovery assets. The tactical situation will be of prime importance. In offensive situations, BDAS personnel may go as far forward as combat trains to inspect and assess damage. In defensive situations when units are rapidly changing battle positions, most of the work which the unit itself can not perform will be evacuated to the field trains; otherwise, the inspectors and mechanics woud risk being overrun in the middle of a job. In any case, the use of maintenance collecting points and collocation of field trains with the FASTs are of critical importance. There are simply too few BDAS personnel to require inspectors to hunt for damaged vehicles in forward areas. In any case, the inspectors must be kept appraised of the tactical situation at all times.

A second critical factor is whether the inspectors can communicate with their base. If so, parts and mechanics can be dispatched forward as needed. If not, inspectors will take mechanics and parts with them and rely on handcarried messages for resupply. Finally, the time in relation to the beginning of hostilities will be important. Prior to combat, almost all work will be repair of simple mechanical failures and can be done forward. Actual battle damage, if severe, will usually need to go to the rear to "make one out of two."

The ASB and its BDAS concepts have worked well in the test of the RGS concept. The question remains whether a GS maintenance unit needs to exist, especially in light of an *XM-1* whose proposed maintenance allocation chart prescribes little GS work. The alternative would be a combined DS/GS unit emphasizing forward repair. There are several reasons why a RGS, weapons-system-oriented battalion will be necessary.

First, the depots will not be going to combat. There will continue to be a need for more complex repair than can be performed by a DS unit in several hours near the front. It is unlikely that we will be blessed with such a surplus of major assemblies or end items and can write off damaged vehicles as combat losses or switch engines for minor malfunctions.

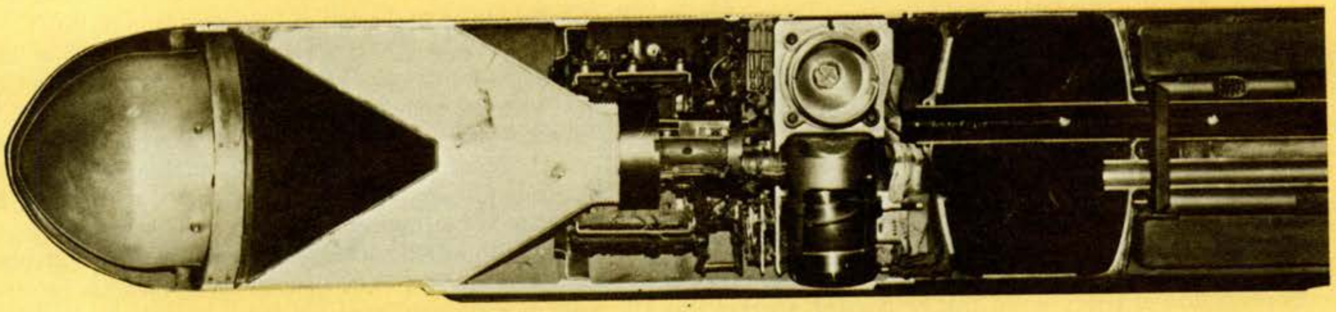
Second, when repairing or cannibalizing combat vehicles, it is essential that work be done as rapidly as possible and the vehicles be returned to action. The transportation assets of the ASB easily cover the evacuation and return of the combat vehicles. The rebuild capabilities of the maintenance company in a site well to the rear will allow the major overhaul of vehicles almost similar to what a depot would perform, but using field expedients. The BDAS provides an on-the-spot link with the front which adds flexibility and keeps the corps commander as well as the battalion commander appraised of his overall maintenance situation.

Third, it is difficult to see how a DS battalion could perform both forward repair and rear, fixed-site overhaul for a division without either creating command and control problems or growing to an unmanageable number of independent companies.

Finally, there is a question of practicality. A DS company must support all types of vehicles. DS mechanics therefore lack the in-depth experience that the soldiers of a RGS battalion have on a particular weapons system. When combat losses begin to escalate, we will need soldiers who know our combat vehicles from the bottom up and can perform major repairs as second nature.

The nature of our times requires that we preserve our assets of combat vehicles perhaps better than any army in the past. If resupply becomes difficult or impossible, we will need to fix what we have, as best we can and as fast as possible. The RGS concept embodied in the Armor Support Battalion will enable us to do so. It is a unit that can answer the tanker's question as to where he will get his replacement tank.

CAPTAIN DOUGLAS R. BOULTER was commissioned through ROTC at Dickinson College in 1973. Following graduation from the Armor Officer Basic Course he was assigned to 1st Brigade, 3d Armored Division, where he served as a tank platoon leader, support platoon leader, and Brigade S-5. After the Armor Officer Advanced Course, he was assigned to the Armor Support Battalion at Fort Hood where he is presently the BDAS Officer and HHD Commander.



Shaped Charges Versus Armor —Part III

by Joseph E. Backofen

This continues the series on tanks and the technologies of armor penetration, armor, and survivability.

Previously, shaped-charge grenades, grenade-type weapons, recoilless crew-served weapons, and antitank guided missiles have been shown to have been developed so that infantry could efficiently provide for their own local defense against armor. Table 4 presents data for shaped charge-carrying, gun-fired projectiles. These have generally been developed as secondary ammunition for gun systems that can fire kinetic energy projectiles and as self-protection ammunition for artillery. Typically, a projectile of a given caliber is adapted to all the weapons from which it can be fired. Thus, the effective range is dependent upon the characteristics of the weapon and not the shaped-charge projectile. Furthermore, the ammunition is typically multipurpose, which means that the shell casing is rather thick, so as to provide effective fragmentation. This makes a comparison of armor penetration performance for ammunition weight rather pointless. In summary, tne remaining important factor for gun-fired shaped charges is whether or not they can pierce and destroy tanks.

When the Soviet *T-34* was introduced during World War II, the German *Hohlladung Granate 38* was, for a while, the only weapon that could stop it at significant ranges. Even then, the armor penetration of this shaped-charge shell design was not overly impressive, because the rotation (spin) needed for projectile stability significantly decreased the performance of the shaped charge.

Projectile rotation generally kept the armor penetration performance of early gun-fired shaped charges to about 1 to 1-1/2 calibers for several reasons. The principal reason is that the conservation of rotational momentum during the collapse of the liner causes the spin to increase such that the hot metal jet feels the pull of a large centrifugal force. (This can be experienced by pulling your extended arms in toward you rapidly while you are spinning on skates or on a stool.) This pull can cause the jet to fly apart like a fragmenting high explosive shell, if the rotation is very great or the jet material is near its melting point.

If the rotation is not that great or the jet material is still rather tough, then it can be pulled apart into larger particles by the misalignments that will occur between the axis of shell rotation and the centers of mass along the jet. For example, there will be a variation in the diameter of the jet and between the jet and the centerline of the charge due to nonuniformities in jet formation as a result of manufacturing imperfections.[30] Theoretically, a shaped-charge jet formed from a rotating charge will always be poorer than one from a nonrotating charge since part of the jet material's ultimately achievable length will not be used along the path to and through the target.

The rotation of a shell carrying a shaped charge can be countered by driving the collapsing liner in a rotation counter to that of the shell.[31,32] However, techniques such as this are only effective at a specific rotation rate. Another method of countering shell rotation is to mount the shaped-charge warhead in ball bearings so that the outer shell rotates freely about the warhead. This has been successfully developed and fielded by the French in the form of the 105-mm *OCC-61* used by the *AMX-30* tank.[33-35] However, the use of slipping rotating bands and either fixed fins or pop-out fins has allowed gun projectiles to be fired from rifled or smoothbore guns at very low rates of rotation that do not affect the formation and armor penetration capability of the shaped-charge iet.[33,34]

The techniques of a slipping rotating band and pop-out fins were apparently first applied in a German World War II, 75-mm projectile.[36,37] The techniques are now commonly used on all modern gun-fired, shaped-charge projectiles with the effect that the shaped charge can achieve performances similar to those of grenade-type, shaped-charge warheads.[32-34,38-40]

The weaponization of shaped-charge technology to defeat tanks appears to have been pushed at the highest rate by Germany before and during World War II. This is evidenced by the many shaped-charge weapons and gun-fired projectiles that were developed and fielded.[10-12,41] In direct contrast, it appears that the Soviets were surprised by the German introduction of the *Hohlladung.*

From an analysis of the technology disclosed in scientific literature and the hardware used during World War II, it appears that Germany utilized the more advanced technologies in comparison to England and America, that Japan manufactured early designs transferred from Germany,[10] and that the USSR copied ammunition captured on the battlefield; especially that which the Germans had made for the guns they had captured from the Soviets in 1941.[2] However, the Soviets now appear to have been among the leaders, including Germany and Sweden, in effective shaped-charge firepower since the late 1950's - early 1960's, as can be seen from the MOEs in Tables 1, 2, and 3, as well as the armor penetration capability of the projectiles presented in Table 4.

Table 4. Principal Tactical and Historical Characteristics Of Some Shaped-Charge Ammunition/Projectiles Fired by Artillery and Tanks

NAME	ARMOR PENETRATION (mm)	WEIGHT (1) (kg)	YEAR FIELDED	COUNTRY OF ORIGIN
7.5-cm Gr. 38 HL/A (2)	75	5.8/4.5	41	Germany
8.8-cm Gr. 39 HL/A or HL/B	90[3]	16.0/7.7	41	Germany
10.5-cm Gr. 39 HL	105[3]	11.6*		Germany
10.5-cm Gr. 39 HL/A	105[3]	12.3*		Germany
10.5-cm Gr. 39 HL/B	100[3]	12.1*		Germany
10.5-cm Gr. 39 HL/C	100[3]	12.2*		Germany
15.0-cm Gr. 39 HL/A	160[3]	25.0*	41	Germany
76.2-mm Gr. 38 HL/B or HL/C	75		42	Germany
3.7-inch MK1	64	/15.0	42	U.K. (India)
76-mm UBP-353/BP-353	60	5.7/4.0	43	U.S.S.R.
75-mm HL Gr. 43			43	Germany
8.8-cm Panzergr. 39/43 HL		10.2/7.7	43	Germany
70-mm TYPE 3		— /2.8		Japan
75-mm TYPE 2	84	/3.5	44	Japan
76-mm	100	7.4/5.1		Yugoslavia
75-mm	175	14.1/		France
75-mm M-66	90	7.1/6.0		U.S.
76-mm UBP-354M/BP-350M	119	5.7/4.0	50	U.S.S.R.
9-cm PAK model 50	290	3.2/2.0	50	Swiss
122-m VBP-463A	203	17.2/13.3*		U.S.S.R.
105-mm M-67	115	16.8/13.3		U.S.
90-mm Sp gun IKV105	360	14.1/10.3	56	Sweden
90-mm M-348/M-348A1		15.8/		U.S.
76-mm M-496		9.3/		U.S.
90-mm M-431	(220)	15.0/5.7		U.S. (W. Germany)
120-mm M-469		23.9/14.1*		U.S.
105-mm M-456	360	21.8/10.3		U.S.
105-mm	100	13.3		Yugoslavia
100-mm/UBK-4M/ZBK-5M	390	25.5/13.4	60	U.S.S.R.
105-mm OCC-F1 (OCC-61)	400	22.2/10.9	61	France
90-mm OCC 62	320	8.9/3.7	62	France
115-mm UBK-3/BK-4 (-4M)	440	26.6/13.2	62	U.S.S.R.
100-mm JPrSv	335	20.5/9.5	63	Czech
122-mm VBK-3/BK-6M	460	29.3/21.6*	63	U.S.S.R.
76-mm UBK-354M/BK-354M	280	9.8/7.3	66	U.S.S.R.
85-mm UBK-1M/BK-2 (-2M)	unk	13.4/7.4	69	U.S.S.R.
90-mm	unk	10.7/4.5	75	Sweden
152-mm M409	unk	22.0/		U.S.
105-mm OOC MECA M32	350	13.9/5.7		France
90-mm PRB-NR478	300	7.6/4.1	Dev.	Belgium
90-mm PRB-NR181	400	12.3/5.9	Dev.	Belgium
120-mm HEAT-MP	500	23.0/13.5	Dev.	Germany
125-mm	unk	unk/unk	unk	U.S.S.R.
120-mm	unk	24.0/13.0	Dev.	France

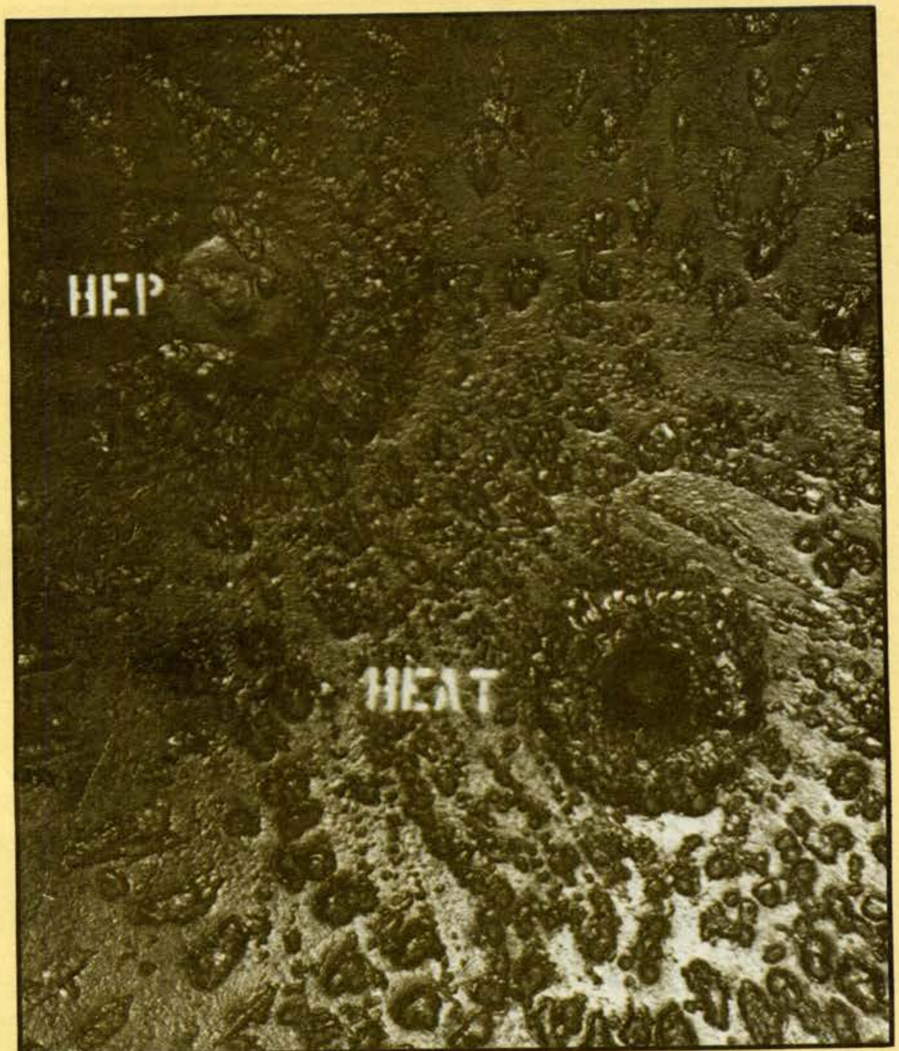
* Projectile only or separate loading ammunition
(1) Ammunition/projectile
(2) There were four different designs HL, HL/A, HL/B, and HL/C, which were used with different propelling cartridges to provide a fixed antitank round for the various 75-mm infantry guns.
(3) Penetration is at German 60° which equals U.S. 30° obliquity.

Still the question arises, "Are shaped charges effective on the battlefield?" The answer definitely is "yes." The *PIAT* and *Bazooka* were effective in North Africa and Europe.[7,9] The *Panzerfausts* were effective on the Eastern Front.[22,25] The *M-72* LAW was somewhat effective in Vietnam.[17] The *RPG-7* was found to be very effective in Vietnam and the Arab-Israeli confrontations.[17,18,42] *Sagger* (*Malyutka*) and TOW have similarly been effective in combat.[17,18,42]

A further question should be, "Was the course of shaped-charge weaponization and effectiveness predictable?" The answer to this lies in examining parallel segments of weapon technology, such as those effective against warships. In this way, one would discover that the shaped charge has an earlier parallel in the large explosive charges used to attack the warship's hull, namely: the mine, the attached explosive charge (*Limpet* mine),[43] the torpedo, and the precision guided munition.[20,44-46] It is even interesting to note that a shaped charge was employed in an experimental torpedo warhead tested in 1913 by the British,[47] but that they and the Germans considered the spaced armor/compartmented ship armor construction too resistant/localizing for the directional effect to be effective.[48]

When first developed, the torpedo attacked the warship with both a high probability of kill for a hit and a high probability of hit.[45] They have proved very effective in warfare since the 1860's[45] Early models were wire-guided; but later development led to fire and forget weapons that travelled a fixed path[45] (much like the new Israeli *Picket* ATGM[49]). Later, acoustic homing led to true fire-and-forget torpedoes such as are presently used by the navies of the world.[45]

The destructiveness of the large explosive charge used as the torpedo's warhead forced the ship designers to increase the thickness of the armor belt; to utilize simple spaced armor; to incorporate fillers, such as coal/fuel oil/seawater within spaced armor; to compartment the interior so as to limit behind-armor damage; and to devise torpedo nets (standoff screens) for use when at anchor.[44-48] (Much like the *RPG*



screens used in Vietnam.) With early torpedoes, active defense took both the form of shooting at the torpedo and ship maneuvers to avoid its impact once its firing had been detected.[45] When the launching platform was a lightly armored surface vessel, it was harassed by fire.[45]

The torpedo became the primary weapon of the submarine, which used the sea as both a hiding place and protection from the weapons of other warships. It later became a weapon for delivery by aircraft. But some noticed that the warship was softer to attack from the vertical direction and so aircraft began using guided glide bombs and missiles such as the German *Fritz X* and *HS293*.[20,21,46] The U.S. later had similar devices like *RAZON* and *Bat*.[46] These developments not only preceded the ATGM, but were the parents of the various approaches taken to fathering the *X-7* ATGM.[20,21,50]

Within naval forces, emphasis rapidly shifted to aircraft as offensive/defensive weapons and to air defense gun/missile system for engagement of both hostile aircraft and guided munitions.[51] These have preceded similar lines of effort with ATGM on aircraft/helicopters for engaging tanks. But the trend is applicable even to the conclusion that the carrier aircraft is the softer component and that it must be attacked by an offensive/defensive system, if the armored land forces are to survive air attack by ATGM.

Top attack of warships was not begun by or limited to that of precision guided munitions. They were attacked with bombs as evidenced by the attack against the *Sulton Selin* in 1917.[44] It is obvious that a 250-kg bomb is not needed to attack an armored vehicle, and that it would be better to distribute this weight in the form of bomblets. During World War II, Germany developed and used *SD2, 4,* and *5HL* bomblets for precisely this role;[52,53] while the Soviets used an unknown type of bomblet.[54]

More modern equivalents are the British Hunting Cluster Bomb[55] and the West German *MW-1* system using *KB-44* bomblets[40,56] as well as the improved conventional munitions fired from artillery tubes such as *M-42* shaped-charge bomblets.[57,58] Recent technology advances have even allowed these munitions to have terminal guidance in order to increase the probability of hit.[58,59] Defense against top attack of warships with bombs could only be provided by aircraft and air defense weapons. Here, however, the tank has an advantage in that it can take cover within buildings or under trees.

Unguided rockets were developed for rapid aircraft attack of hard targets such as ships and tanks so that the aircraft would have the target impact capability of 3-inch to 5-inch cannon without having to suffer the recoil of a gun. During World War II, Germay utilized the *Panzerschreck* crew-served weapons as an experimental aircraft weapon on the Eastern Front.[22] This later expanded into the *Panzerblitz* weapons which used the *Panzerschreck* warhead on rocket motors, such as the *R4M*.[22] During World War II, the Soviets used an unidentified antitank rocket on the IL-2 *Sturmovik*.[54] The U.S. has developed the familiar 2.75-inch rocket for this type of attack against tanks by aircraft and helicopters, while the Soviet Union now employs the 57-mm *S5K* on its ground attack aircraft and helicopters.

Bottom attack of warships was performed principally by mines and influence-fuzed torpedoes;[45] and although shaped-charge technology has been simlarly used in antitank mines, this will be deferred until the next article of the series, "Antitank Mines, Boobytraps, and Their Disruption."

It should be noted for now that shaped-charge weapons such as the *Panzerfaust* were used as ambush devices.[11] Similarly, the 3.5-inch *Super Bazooka* rocket was developed into the *M-24* off-route mine;[13,60,61] and the *Viper* is supposed to be equipped for use as an off-route ambush weapon.[58,67] These applications require the projection of the warhead to/against the target. However, large shaped charges such as the *M-2,* and *M-3* used by the U.S. Engineers can be used as off-route mines, (like the antipersonnel *Claymore*), whereby they would project their jet at or through the target tank at reasonable standoffs.[63]

More recently, modified shaped-charge technology (mass focus or P-Charge) has allowed the formation of a single very high velocity projectile

from the lined hollow such that it can rapidly traverse relatively great distances in order to attack a tank.[64,65] This has been weaponized for some time in devices such as the Hungarian plate-charge antitank mine and the French *MAH-F1*.[13] Similar technology was known as early as World War II as the Miznay-Schardin effect.[2] More recently, these technologies are the bases of the various new wide area antiarmor munitions concepts for artillery, aircraft, and cruise missile delivery,[58,65,67] as well as flyover-shoot-down munitions concepts.[68]

Due to its ability to pierce great thicknesses of armor in order to reach the vulnerable materiel/personnel behind it for a relatively small weight and volume, the shaped charge has been weaponized into many varied forms of antitank weapons. Even though many of the weapons reached a performance plateau and remained there for around 20 years, they should soon exhibit new modification or advancement in response to compound armor developments. This should be especially evident in the development of a new grenade-type LAW since infantrymen cannot allow themselves to be overrun by armor.[69] Weapons larger than these need to be transported by mechanized vehicles if they are to outrace enemy armor to their objectives. The most obvious developments in this regard will probably be associated with armed armored helicopters.[70,71]

The tabular data for this article have been compiled from both the references and other materials which have been gathered into a bibliography available from the author at Battelle's Columbus Laboratories, 505 King Avenue, Columbus Ohio 43201.

Footnotes

*Footnotes 1 through 29 referenced in this article appeared earlier in **ARMOR** on page 21 of the September-October 1980 issue.*

[30]N. S. Kozin, "Stability of a Cumulative Jet," *Fizika Goreniya i Vzryva*, No. 2, April-June 1972, pp. 315-317.
[31]"PA26, Drallstabilisiertes Hohlladungsgeshoss," *Militartechnik*, No. 8, 1968, pp. 379.
[32]Yu. Volynskiy-Basmanov, "Artillery Ammunition," *Teknika i Vooruzheuyye*, No. 8, 1976, pp. 16-18.
[33]W. Kiesshauer, "Trends in the Development of Artillery Shells," *Militartechnik*, No. 8, 1972, pp. 340-343.
[34]"Anti-tank Weapons, 1) Guns and Missiles," special report, *Armies & Weapons*, 20, November 74-February 76, pp. 45-54.
[35]J. Perin, "AMX-30 Firepower—the 'Obus G' HEAT Round," *International Defense Review*, Special Series, Battle Tanks, 1976, pp. 162-165.
[36]"German 75-mm Hollow-Charge Shell, With Free Rotating Bands and Fins," photograph A37330, Aberdeen Proving Ground, Maryland, 16 April 1946.
[37]I. V. Hogg, "The Guns: 1939-45," Ballantine Books, New York, 1976.
[38]"Details of the Soviet T-72 Battle Tank," *International Defense Review*, Volume 10, No. 6, December, 1977, pp. 1031-1034.
[39]R. D. M. Furlong and R. B. Pengelley, "Main Armament for the XM-1 Tank—Storm Over the Selection Process," *International Defense Review*, Special Series, Battle Tanks, 1976, pp. 159-161.
[40]W. Flume, "Munition, Leistungsteigerung auf allen Gebieten," *Wehrtechnik*, No. 8, 1979, pp. 27-39.
[41]T. J. Gander, "Field Rocket Equipment of the German Army 1939-1945," Almark Publishing Co. Ltd., London, 1972.
[42]S. Lofgren, "Missiles Against Tanks and Aircraft," *Armies & Weapons*, 31, 15 January-14 February, 1977, pp. 5-7.
[43]R. S. Macrae, "Winston Churchill's Toyshop," Walker and Company, New York, 1971.
[44]W. Hovgaard, "Modern History of Warships," 1920, reprinted by United States Naval Institute, 1971.
[45]V. P. Beloshitskiy and Yu. M. Boginskiy, "Underwater Weapons (Oruzhiye Podvodnogo Udara)," Military Publishing House, Moscow, 1960. (Translation released to public as ADA046104, National Technical Information Service, 1977).
[46]I. V. Hogg and J. Batchelor, "German & Allied Secret Weapons of World War II," Chartwell Books, Inc., Secaucus, New Jersey, 1976.
[47]Lt. H. W. Kline, USNR, and Lt. (jg) J. F. Mackman, USNR, "The Cavity Charge, Its Theory and Applications to the Opening of Explosive Filled Ordnance and Other Special Cutting and Drilling Operations," Ordnance Investigation Laboratory, Naval Powder Factory, Indian Head, Maryland, August 14, 1945.
[48]W. Wunderlich, Editor, "Introduction To The Theory of Underwater Explosions (Einfuhrung in das Unterwasser-Sprengwesen," *Chemisch-Physikalische Versuchsanstalt der Marine*, Kiel, 1945.
[49]"Missile Systems — I.A.I. Picket," *International Defense Review*, Volume 12, No. 6, 1979, pp. 971-972.
[50]R. F. Pocock, "German Guided Missiles of the Second World World War," ARCO Publishing Company, Inc., New York, 1967.
[51]D. Bowen, Editor, "Encyclopedia of War Machines, an Historical Survey of the World's Great Weapons," Octopus Books Limited, London, England, 1977.
[52]H. Schardin, "Uber die Entwicklung der Hohlladung," *Wehrtechnische Hefte*, Vol. 51, No. 4, pp. 97-120.
[53]Private communication by Prof. F. R. Thomanek regarding the developmental SDIHL and the 4 kg. SK4HL bomblets.
[54]G. Biryukov and G. Melnikov, "Antitank Warfare." Progress Publishers, Moscow, 1973.
[55]J. Marriot, compiler, "International Weapons Developments," 3rd Edition, Brassey's Publishers Limited, London or Presidio Press, San Rafael, California, 1979.
[56]"International Defense Digest-MBB Testing MW-1 Scatter-Weapon", *International Defense Review*, Volume 11, No. 4, 1978, pp. 489-490.
[57]W. Field and H. I. Huff, "New Ammo Plant Design Reflects Milestone," *U.S. Army Man Tech Journal*, Volume 2, No. 3, 1977, pp. 11-17.
[58]"Future Programs Dominate U.S. Army Show," *International Defense Review*, Volume 11, No. 1, 1978, pp. 86-92.
[59]C. F. Foss, "Jane's Armour and Artillery 1979-80," First Edition, Franklin Watts, Inc., New York, 1979.
[60]"Land Mines, Section III Off-Route Mines," Change No. 5 to TM 9-1345-200, Headquarters, Department of the Army, Washington, D.C., 30 October 1968.
[61]"Tactics, Techniques, and Concepts of Antiarmor Warfare," FM 23-3, Headquarters, Department of the Army, August 1972.
[62]"Highlights of the 1978 AUSA: Viper," *International Defense Review*, Volume 12, No. 1, 1979, pp. 67.
[63]"OSS Sabotage & Demolition Manual," reprinted by Paladin Press.
[64]M. Held, "Leistungsgrenzen von konventionellen Ladungstypen," *Jahrbuch der Wehrtechnik*, Folge 11, Wehr & Wissen Verlagsgesellschaft mb H Koblenz/Bonn, 1978, pp. 204-210.
[65]G. Randers-Pehrson, J. W. Hermann, and E. R. Berus, "Experimental and Analytical Investigation of Self Forging Fragments for the Defeat of Armor at Long Standoff," Paper F2, Third International Symposium on Ballistics, Kalsruhe, W. Germany, March 23-25, 1977.
[66]"Weapons Systems—Assault Breaker," *International Defense Review*, Volume 11, No. 9, 1978, pp. 1436-1437.
[67]R. D. M. Furlong, "WAAM, The U.S. Air Force's Next Generation of Antiarmor Weapons," *International Defense Review*, Volume 11, No. 9, 1978, pp. 1378-1379.
[68]"STAFF Antitank System Tested," *Field Artillery Journal*, Volume 48, No. 1, January-February 1980, pp. 49.
[69]J. Weeks, "The New British Army Light Anti-Armour Weapon," *Defense*, Volume 10, No. 4, April 1979, pp. 228-229.
[70]C. Gilson, "Agusta A. 129 Mongoose, Europe's First Day/Night Antitank Helicopter," *International Defense Review*, Volume 12, No. 9, 1979, pp. 1511-1514.
[71]D. R. Griffiths, "Altered Helicopter Plan Urged", *Aviation Week & Space Technology*, January 7, 1980, pp. 14-15.

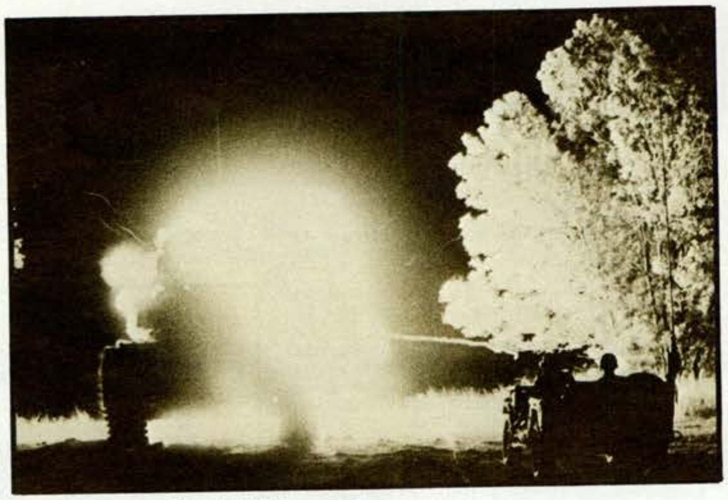
JOSEPH E. BACKOFEN, JR. was commissioned in the Corps of Engineers upon graduation from the Polytechnic Institute of Brooklyn in 1966. While with the 62d Engineer Battalion, his service included Rome Plow Land Clearing Operations in Cambodia and Vietnam. Mr. Backofen is currently involved with the development of advanced weapons technology at Battelle Columbus Laboratories.

The prevailing characteristic of "Hell on Wheels," which extends as far back as I can remember, is this: once it makes up its mind to do something, it does it, and superbly.
—the late Major General Ernest N. Harmon
visit to Fort Hood, Texas, 1977

How many 2d Armored Divisions are there?
—captured German officer
Belgium, 1944

Training a Force That's Fit to Fight

THE 2D ARMORED DIVISION



by First Lieutenant David Vogels

In the days of a peacetime, volunteer Army, in a time of fiscal restraint and manpower shortage, it is a challenge to maintain just one combat-ready 2d Armored Division. The Division has "made up its mind to do something" and is moving towards it objective, but as usual it is fighting uphill at the junction of four map sheets. "A trained, disciplined force that is fit to fight with what it has" is the objective set before the 2d Armored Division by its new commander, Major General Richard L. Prillaman. It is not an easy goal.

Prillaman, a veteran infantryman, took command of the division in February and told his commanders, "Training is your first priority. Your primary responsibility is to train your immediate subordinates." He then announced that the entire division would go to the field for 3 weeks in May, and shortly thereafter he issued a letter that put training on a 6-month cycle, primarily because of the rapid turnover of personnel.

Company training according to the Army Training and Evaluation Program is scheduled every 6 months, with battalion ARTEPs every 18 months.

Infantrymen and engineers qualify with individual weapons at the beginning of each 6-month cycle and also conduct individual and collective live-fire exercises within each cycle. Tank, TOW and mortar crewman alternate between individual annual qualification and sustainment firing at the beginning of their 6-month cycles; tank crews fire annual tank gunnery alternating with off-season gunnery.

Support units also fire individual weapons every 6 months, and they are required to establish a perimeter defense and conduct a live-fire exercise during each company cycle.

Add to this periodic battle runs at every level and rigorous Expert Infantry Badge and Expert Field Medical Badge testing, and it becomes obvious that "Hell on Wheels" units spend a good deal of time on the wooded, rolling hills of central Texas. The program is an ambitious one and faces many obstacles.

In addition to a busy training schedule, commanders have to cope with a chronic shortage of junior leaders. "As far as training I'd say we're ready," remarks Captain Tom Williams, formerly assistant S-3 of the 2d Battalion, 67th Armor, and now commander of Company A, 1st Battalion, 50th Infantry. "But the numbers are what kill us. We don't have the NCOs, specifically E-4s through E-6s. But the commander still has a mission to do—you still have to be as fit to fight as possible."

Prillaman has directed his leaders to fill as many low-level teams (like tank crews) as possible rather than stretch personnel among the assigned number of teams. But units are not all

affected in the same way. Lieutenant Guillermo Rodriguez, leader of the Ground Surveillance Radar Platoon, Company B, 522d Military Intelligence Battalion, says, "We're a little short on the lower levels (privates) and not too bad on NCOs. I man the number of teams I can man. The company all works together, and we've managed fairly well so far. We've got a good degree of proficiency—they take pride in what they do."

Another commander, however, reports "I'm at 67 percent strength, and that's what makes it hard. I'm authorized four E-7s, and I have one. I'm authorized 17 E-6s, and I have three. I'm authorized 26 E-5s, and I have 11, including acting sergeants."

As a result, some soldiers are filling jobs for which they have little training. "Usually you'll find a corporal or E-5 as a section chief (a staff sergeant's job)," says Lieutenant Rich Shaw, commander of Headquarters Battery, 1st Battalion, 92d Field Artillery. "He's really new and being put in the position before he should be."

"Some E-5s get promoted too soon," agrees Staff Sergeant Haruo McKinley, reenlistment NCO of the 2d Battalion, 58th Infantry, and 1978 Fort Hood NCO of the Year. "Sometimes he fills a job two grades above him, and he's still in a learning stage. He's in hot water, because whenever he lacks expertise he's going to lose confidence in himself."

All this leads to frustration, which is why some junior leaders say they are leaving the Army. As Captain Dale Mitchell, commander of Company B, 1st Battalion, 50th Infantry, explains, "A lot of junior NCOs want to have some authority and find themselves frustrated in the attempt because they're young and got moved up quickly. They're caught between a rock and a hard place."

Other problems include discipline and the decreasing duration of basic and advanced individual training. "The Army's changing based on society in general," Mitchell says. "The younger troops aren't getting the hard-core drill sergeant in basic training any more. Those young NCOs are self-disciplined enough to make it up there, but the troops they're leading are the ones that weren't self-disiplined. When they're placed in a leadership position and the response is not there, they're frustrated."

"The majority of troops I've been getting lacked a basic education," adds one NCO. "They have a hard time comprehending even the Soldier's Manual, so the commander has to enroll them in the Basic Skills Education Program and that takes them away from the unit. Right now there's a big written portion on the Skill Qualification Test, and I'd say 30 to 40 percent have trouble comprehending it."

Leaders are also faced with what often seems to be a never-ending stream of requirements from all sides. McKinley says, "My biggest problem is I don't have the flexibility to control training time. Priorities are not always defined for the commander, and we're channeled in too many different directions."

Fort Hood officials are trying to combat these training obstacles. For example, Lieutenant General Richard E. Cavazos, III Corps and Fort Hood commander, has ordered that company-level schedules be frozen 5 weeks in advance to prevent last-minute changes by higher headquarters. Prillaman is holding his commanders to a 9-hour work day (including an hour for lunch) and a minimum of weekend training when their units are in garrison. As he emphasized in his training letter, "Our soldiers, particularly our NCOs, are vulnerable to the enthusiasm of commanders who have too much to do and too little time to do it. The result is that our troops are victimized by poor planning and a failure of training managers to consider time and space factors. This policy is intended to train commanders and staffs to plan the use of available time."

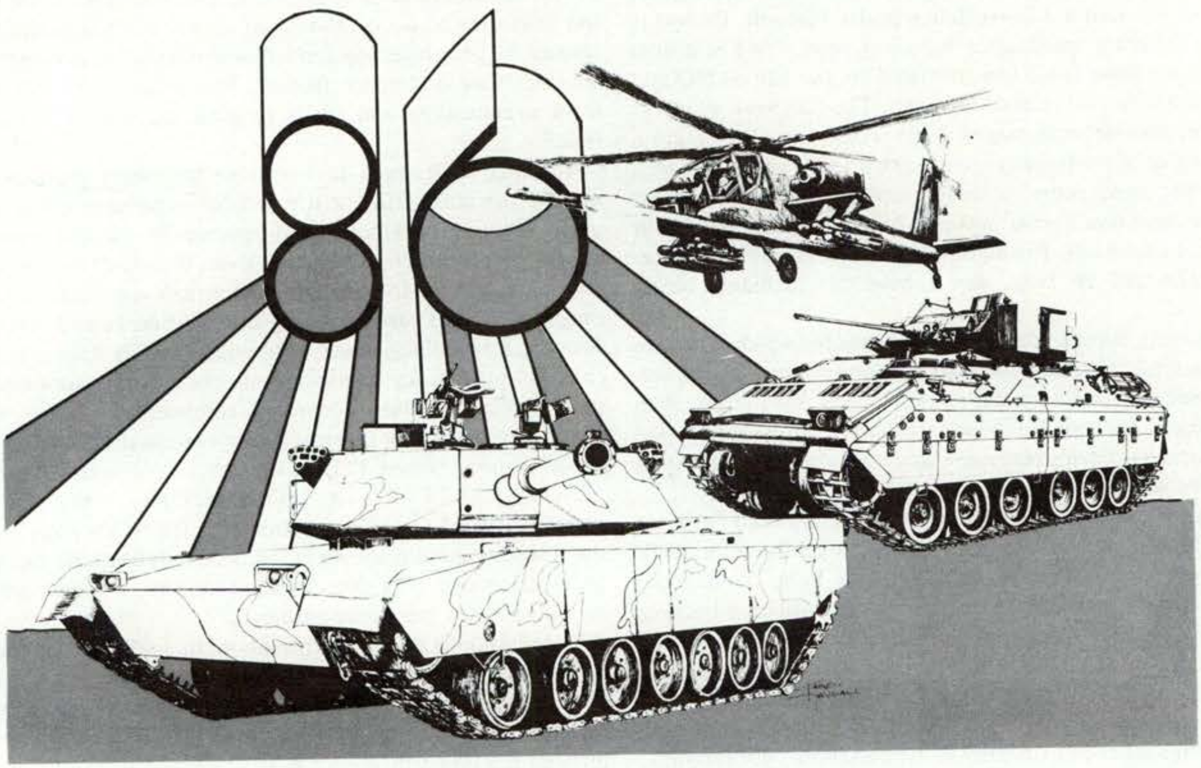
Training is designed to overcome personnel shortage by making the most efficient use of what experience exists in a unit. While Fort Hood's 200-square-mile training area is always bustling, there are other avenues that don't require taking large groups to the field. Mini-tank and mini-mortar ranges, a TOW *Dragon* tracking site, confidence and obstacle courses, a rappelling tower, a physical-training course and a chemical-proficiency course are all close to the cantonment area. Prillaman also encourages commanders to use war games, map exercises, command-post exercises and tactical exercise without troops (TEWT) to save time and resources. "I've used the TEWT a lot," agrees McKinley. "As a platoon sergeant, I tried to arrange training for the NCOs away from the troops to go over the basic fundamentals of leadership and let them develop confidence. Then they have a more positive attitude toward job accomplishment."

The division is also concerned about its soldiers' education. It maintains a complete MOS Library, and there are also programs in testing and counseling, high school certification, and college courses up to graduate level that can be arranged through the post education center.

In their off-duty time, "Hell on Wheels" soldiers can take advantage of Fort Hood's myriad of recreation centers, libraries, bowling allies, craft shops, theaters, gymnasiums, tennis courts, golf courses and clubs of all kinds. There is also an active division sports program, and the Belton Lake Recreation Area is located on post. Persons assigned to Fort Hood are within driving range of Dallas, Houston, Austin, San Antonio, Mexico, and the Gulf Coast beaches.

No one ignores the substantial challenges facing the 2d Armored Division, but no one pretends its problems are unique. Sergeant First Class Francis Shouse, a former tank commander and first sergeant who is now G-3 operations NCO, puts it this way: "If I had to be in one division, this would be it." In 1980 there is only one "Hell on Wheels," working to make the most of its available assets and striving to match today's performance to yesterday's reputation.

FIRST LIEUTENANT DAVID VOGELS is the Command Information Officer of the 2d Armored Division. Now a member of the Adjutant General's Corps, he was an honor graduate of the Field Artillery Officer Basic Course. He holds a bachelor's degree in journalism and a masters degree in music literature. His articles have appeared in many Army and civilian publications.



Increased Combat Power

by Lieutenant Colonel Ralph G. Rosenberg

The Army will move ahead with the Division 86 study and the concept of a standard heavy division with flexible tactical organizational structure. Division 86 will provide an objective force from which analysis of the equipment and personnel requirements can be conducted, and the necessary follow-on decisions made . . . . In addition to Division 86 (Heavy), the Army 86 studies also encompass the light division, corps, and echelons above corps. Force structure requirements resulting from these studies must be viewed from a Total Army standpoint to ensure proper force balance.

General E. C. Meyer
Chief of Staff of the Army

Organizations ranging from the tank and attack helicopter platoons to the armored cavalry regiment have been redesigned as part of the Division and Corps 86 studies conducted by the Training and Doctrine Command (TRADOC). The force design effort began in the fall of 1978 and has included the participation of the commandants and their staffs from all the Army's schools and centers. The end result has been a series of detailed operational and organizational concepts that describe what each organization does on the battlefield and how it is organized to do it.

The study was initiated as part of the Army's force modernization effort. The purpose was to develop organizations and doctrine to assimilate the new systems of the 1980's, and to optimize their employment. Ten Division/Corps 86 task forces were formed. Each addressed a functional area. The U.S. Army Armor Center was a member of the Target Servicing Task Force, along with the Infantry, Aviation, and Combined Arms Centers.

This article highlights the overall design of the heavy division and summarizes the operational and organizational concepts for the tank and mechanized infantry battalions, air cavalry attack brigade, (ACAB), division cavalry squadron, and corps armored cavalry regiment.

The Heavy Division 86 organization (figure 1) continues to reflect the flexible design philosophy of the Reorganization Objective Army Divisions (ROAD), fielded in the early 1960's. The division base concept was retained and brigades continued as tactical headquarters, task organized for combat.

An alternative to the ROAD concept was proposed by the Armor Center that envisioned fixed brigades. These brigades would provide the commander self-sufficiency in terms of maneuver battalions, field artillery, air defense artillery, engineers, and combat service support. This concept recognized how we fight—as a brigade task force. The principal objection to the concept was its impact on the division base. The Army

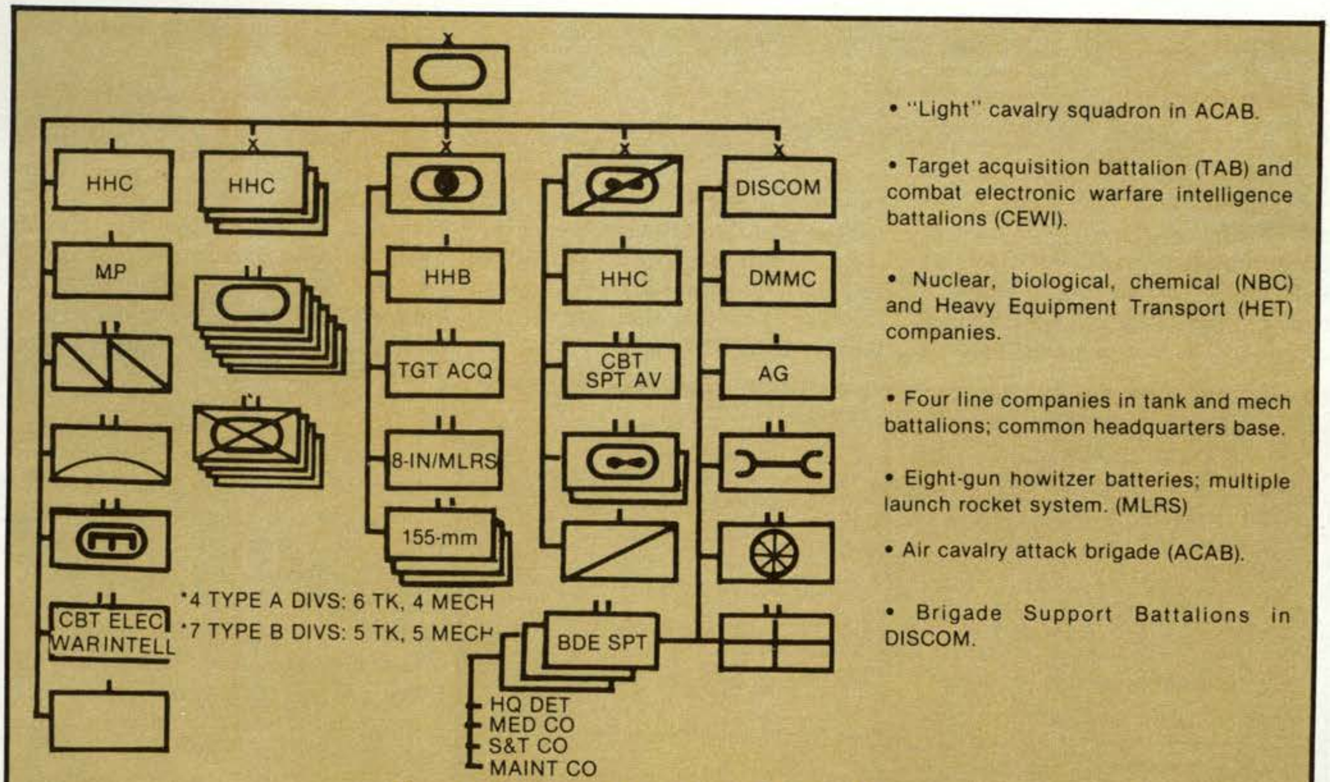


Figure 1. Organization highlights of Division 86

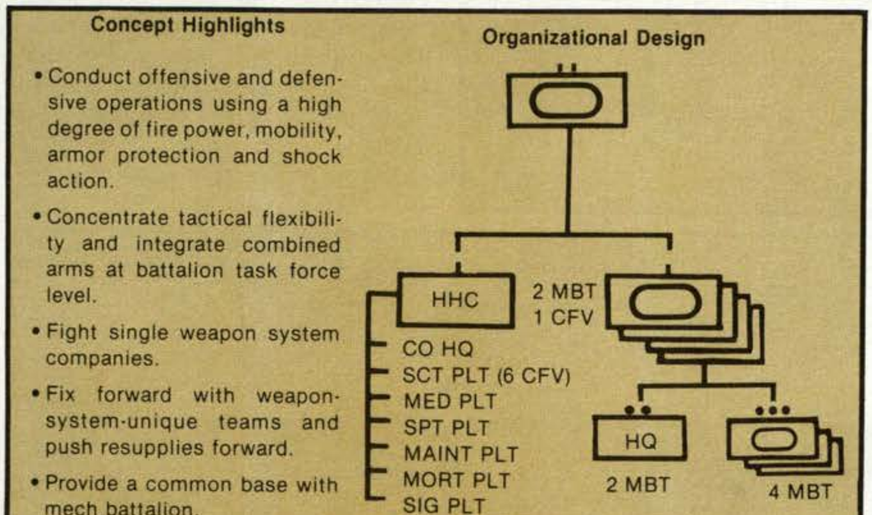


Figure 2. Tank Battalion

cannot afford to have large divisions and large brigades. With the assignment of many of the assets at division level to brigades it meant the division base would become very small. Thus, the roles of the division and brigade would be reversed: the division would be a tactical headquarters and the brigades would become self-contained. The fixed-brigade concept also impacted on the ability to do strategic and tactical tailoring. After analysis of the brigade alternatives by the Combined Arms Center, the ROAD concept was retained for Division 86.

The tank and mechanized (mech) infantry battalions were developed by the Armor and Infantry Centers through a series of workshops. The tank battalion (figure 2) reflects a common design and operational concept with the mech infantry battalion (figure 3). The four-tank platoon is employed as an entity. The leader-to-led ratio in both the platoon and company has been reduced. Companies are single-weapon-system organizations (e.g., tank or mech). The tank companies are smaller and the bulk of the combat service support in both the tank and mech companies has been

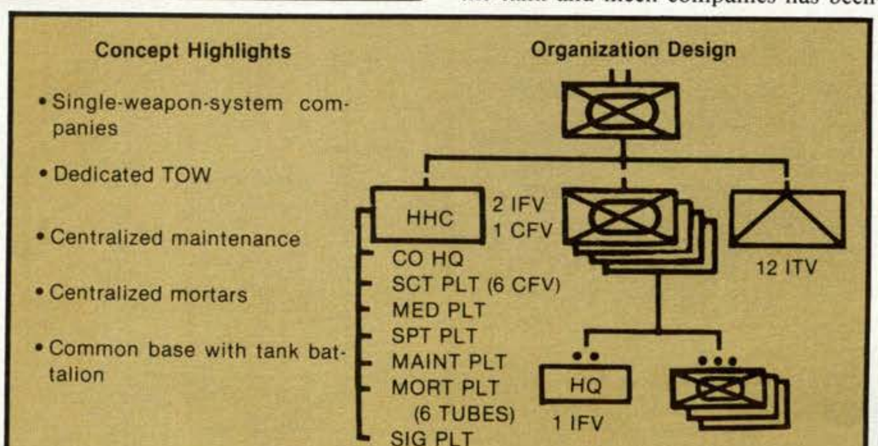


Figure 3. Mechanized infantry battalion.

moved to battalion level. Four line companies provide the capability to conduct wider and deeper actions, to attack on two axes, and defend on two avenues of approach. The integration of combined arms is done at battalion level where there is a more experienced commander and staff. The combat service support has been increased, especially for class III and class V resupply. Support is oriented to weapon system; forward arming, fueling, fixing, and feeding are stressed. (An article in a future issue of ***ARMOR*** will detail the enhancements that have been made in support to the maneuver battalions.)

As an alternative to pure tank and mechanized infantry battalions, the Armor Center recommended the formation of combined arms battalions (figure 4). Three organizations were proposed: balanced (2 tank, 2 mech infantry companies), tank-heavy (3 tank, 1 mech), and mech-heavy (3 mech, 1 tank). The rationale for this proposal was that combined arms battalions recognize how we fight—as a battalion task force. The organization would increase unit cohesiveness and combat effectiveness, as tank and mech infantry personnel would live, train, and fight together. Commanders and their staffs would think and learn daily about the integration of armor and infantry. The combined arms battalion was not adopted for Division 86 because it was contended the army "is not ready." There would be increased training, maintenance, and

Concept Highlights

- Designing combined arms battalions by TOE recognizes how we fight—as a battalion task force.
- Battalions live, train, and fight together providing increased unit cohesion and combat effectiveness.
- Commanders and staff think and learn daily about the integration of armor and infantry.
- Integrate combined arms at battalion level; fight single-weapon-system companies.
- Reduce logistics stress caused by continual cross-attachment and tailoring.

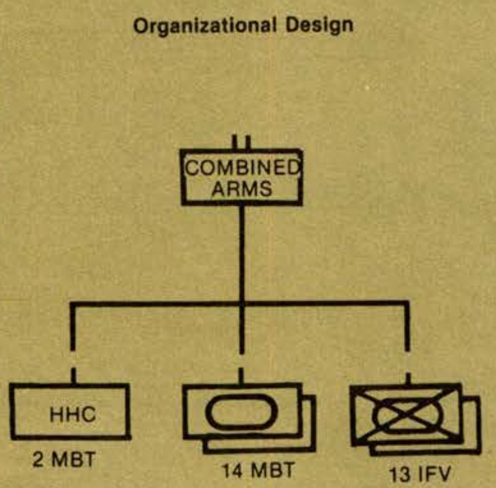


Figure 4. Combined arms battalion.

Concept Highlights

- Provides unity of command for all division aviation.
- Organized for how we fight.
- Separates fighters from supporters.
- Separate organizations for attack and recon.
- Increased leader to led ratios; experience of key commanders.
- Increases combat power.
- Provides similar ACAB design for heavy and light divisions.

Helicopter Abbreviations
AH—Attack
SH—Scout
OH—Observation
UH—Utility
EH—Electronic

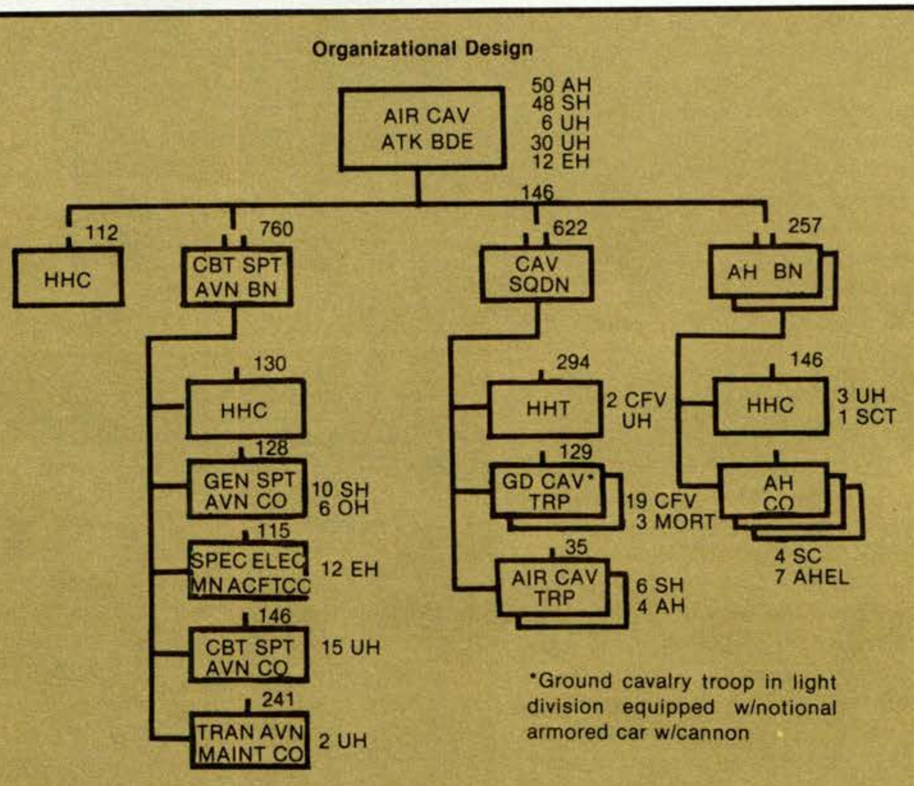


Figure 5. Air cavalry attack brigade (ACAB)

logistic problems.

One of the most significant changes in the division was the creation of the ACAB (figure 5). It provides unity of command for all division aviation and consists of a combat support aviation battalion, two attack helicopter battalions, and the divisional cavalry squadron. The brigade is a maneuver headquarters that has the capability to control both its aerial maneuver units and any ground maneuver forces under its operational control.

The attack helicopter units were redesigned to bring combat aviation in line with the principles that governed the development of the tank and mech infantry units: leader-to-led ratios and span of control were reduced. Each company is commanded by a captain, instead of a major as in today's units. There has been an internal separation of

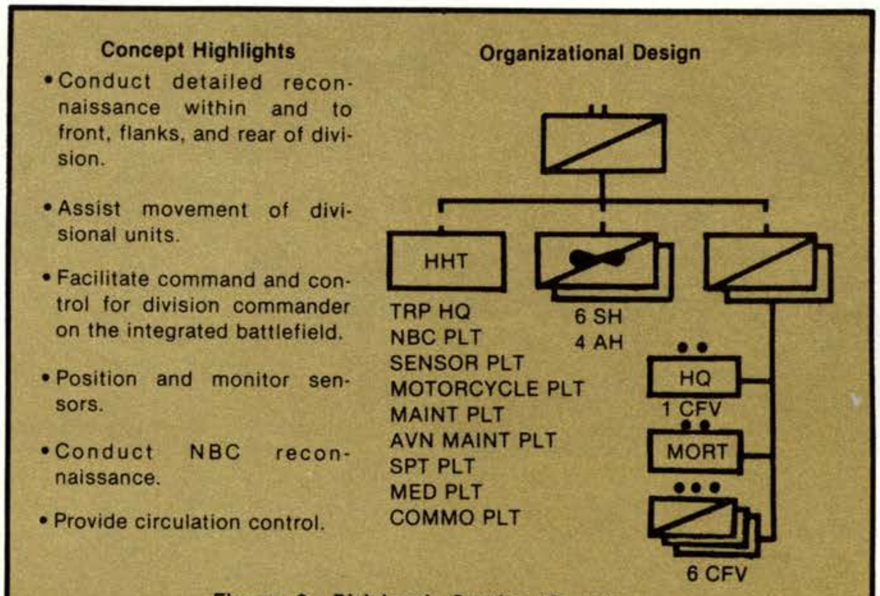


Figure 6. Divisional Cavalry Squadron

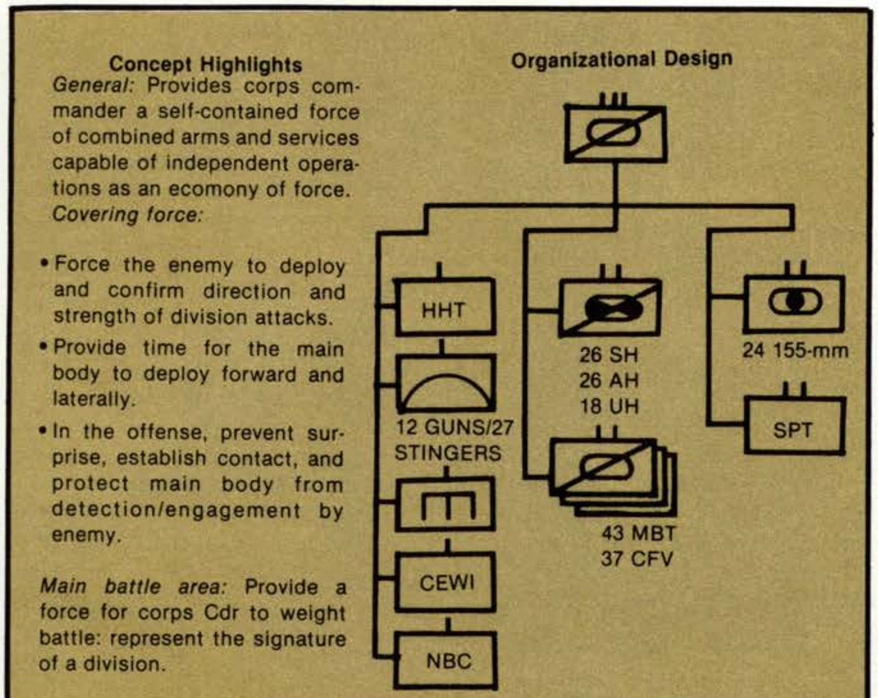


Figure 7. Armored cavalry regiment.

fighters and supporters. The three attack helicopter companies consist primarily of pilots, crew members, and a small company headquarters. All combat service support, including aviation unit maintenance and forward-arming and refueling equipment, has been moved to the headquarters and headquarters company.

The support side of the ACAB is contained in the combat support aviation battalion. This battalion includes companies that support the entire division.

The Armor Center proposed an alternative to pure attack helicopters and air cavalry units. The units were called air cavalry attack troops (ACAT) and air cavalry attack squadrons (ACAS). They performed the dual missions of attack and reconnaissance—find, fix, and destroy. Two squadrons, with four troops each, were assigned to the ACAB. Under this proposal, the divisional cavalry squadron consisted of three ground cavalry troops and was assigned to the division base. Aero reconnaissance support was provided from an ACAS, or one of its ACATs, on a mission basis. The concept was intended to simplify training and make it easier for the Army to articulate the role of attack helicopters and scouts. The ACAS was not adapted for Division 86 because it was decided that the cavalry squadron required its own air cavalry units. Thus, the ACASs reverted to attack helicopter battalions and small air cavalry troops were designed and assigned to the cavalry squadron. The cavalry squadron, with a mix of air and ground troops, was then assigned to the ACAB.

The divisional cavalry squadron (figure 6) was designed based on an operational concept that stresses reconnaissance within, to the front, on the flanks, and to the rear of the division. This function is particularly important on the nonlinear battlefield of the 1980's. The characteristics of this environment and the commander's absolute requirements for timely information place a premium upon the reconnaissance and liaison capabilities of this organization. The tanks were removed from the squadron and the economy of force role was dropped from the operational concept. This was based on the assumption that the heavy division would be assigned to a corps and the armored cavalry regiment would pick up the security missions.

New additions to the headquarters troop include a motorcycle platoon, NBC reconnaissance platoon, and sensor platoon. The air cavalry troops are smaller than the current ones and are commanded by captains. The same design rationale was used here as for the attack helicopter companies, discussed

earlier. The 2:2 mix of air and ground cavalry troops is the same in light division 86 as in the heavy division. The squadron is assigned to the ACAB, primarily for aircraft supportability; however, it normally is employed under the operational control of the division headquarters.

The Armor Center was tasked to develop the armored cavalry regiment as part of Corps 86 (figure 7). The regiment was designed to provide the corps commander a self-contained force of combined arms and services capable of independent operations as an economy of force.

There are three armored cavalry troops and one pure tank company in each of the three squadrons. The integration of armored cavalry was moved from platoon level to troop level by designing troops with two pure platoons of tanks (four main battle tanks) and two pure platoons of scouts (six cavalry fighting vehicles). The scout platoons are organized the same as those in the maneuver battalion scout platoon and the division cavalry squadron. The pure scout and tank platoons in the troop, as opposed to the integrated armored cavalry platoon of today, recognizes the sophistication of the *XM-1 Abrams* tank and *M-3* cavalry fighting vehicle. A captain as troop commander is better qualified to integrate these systems into either pure or scrambled configurations than the lieutenant at platoon level.

Several enhancements have been made to the ACR in combat support. The howitzer batteries have been consolidated into a field artillery battalion to improve command and control. To increase survivability, the eight-gun batteries are structured to operate with two 4-gun platoons up to 1,600 meters apart. An air defense battery has been added to provide the regiment the organic capability to shoot down helicopters. It consists of 12 division air defense guns and the consolidation of 27 *Stinger* teams. The NBC company provides an NBC reconnaissance and decontamination capability. Combat aviation units have been consolidated into a squadron consisting of three air cavalry troops and two attack helicopter companies (same as Division 86), and a combat support aviation company consisting of utility helicopters for command, control, and aerial resupply. The engineer company and combat electronic warfare intelligence company have been retained and upgraded with 1986 systems.

The support squadron provides a full range of services with companies for maintenance, supply and transportation, medical, and administration. Functional support is modulized so that support packages can be provided to each squadron.

In summary, the Division/Corps 86 studies have produced operational and organizational concepts that will assist the Army in the overall force modernization effort. Like any study of this magnitude, there were sharp differences about how the Army should organize and equip itself to fight on the lethal, mobile, nonlinear battlefield of the 1980's.

The failure of the Division 86 study to adopt the combined arms battalion was particularly disappointing, as the fielding of the *Abrams* tank and *M-2/3* infantry/cavalry fighting vehicle provided an excellent opportunity to do so. However, the symmetry between the tank and mechanized infantry battalion is a major improvement over the H-series TOE. It will be easy for commanders in the field to form battalion task forces (combined arms battalions) that live and train together.

The air cavalry attack brigade provides the division commander unity of command for all aviation and a fourth maneuver brigade. The smaller attack helicopter companies and battalions bring combat aviation in line with other members of the combat arms.

The "light" division cavalry squadron, with a concept emphasizing reconnaissance is needed in Division 86—not only to find the enemy but to help the division commander command and control his forces on a confused, integrated battlefield of the future.

The corps' armored cavalry regiment continues to reflect the organizational philosophy that it should be self-contained for the economy-of-force role. Combat support and services have been enhanced.

On balance, the changes envisioned for these division and corps organizations will increase combat power and training readiness. Any suggestions for further improving these organizations should be addressed to:

Commander, U.S. Army Armor Center and Fort Knox, ATTN: Directorate of Combat Developments, Fort Knox, KY 40121.

LIEUTENANT COLONEL RALPH G. ROSENBERG received his B.S. degree from the University of Washington, his M.S. from the University of Southern California, and is a 1977 graduate of the USACGSC. He served tours in Vietnam with the 11th ACR and a surveillance aviation company. He commanded the MI Company in an infantry division and was an instructor at the Field Artillery School. Currently he is assigned to the Directorate of Combat Developments, U.S. Army Armor Center.

Exigent or Obsolete?

Antitank Guns

by Colonel J. Hemsley

The essence of this article was presented to a meeting of the Henderson Society[1] held at the Staff College, Camberley, on 12 November 1975 with the deliberate intent of being sufficiently provocative to stimulate some lively discussion. I seem to remember that this aim was achieved. After pulling it out of a bottom drawer the other day, I was struck how many aspects continue to be relevant, particularly since the 1973 Arab-Israeli war still represents the most recent example of large-scale armoured warfare, and Milan has now been introduced into the British Army of the Rhine (BAOR). Therefore, having dusted it off and polished it round the edges a bit in order to bring it up-to-date, I now venture to present it in the hope that someone somewhere will refute the argument and thereby reassure those of us likely to be in the "thin red line." Colonel J.Hemsley.

* * * * * * *

Within the book, *The Later Cecils,* there is a legendary story which concerns Lord William Cecil, sometime Bishop of Exeter and a man whose absent-mindedness was proverbial. On one occasion he failed to find his rail ticket when asked for it by an inspector. "Don't trouble my Lord" the official assured him, "we all know who you are." The Bishop replied: "That is all very well but, without a ticket, how do I know where I am supposed to be going?"

Surveying the scene presented by current British military doctrine, one is tempted to ask: "How many tickets have been lost?" Therefore, let us take a look at the British philosophy governing infantry antitank defence and weapon design for operations in the Central European Region and decide whether or not it really does meet the perceived requirements. In order to define the problem, it is necessary to examine the nature of the threat posed to NATO forces, particularly to the 1st (British) Corps, in the probable area of operations.

Current assessments paint the picture of a Warsaw Pact deployment of large numbers of tanks and armoured personnel carriers (APCs) against AFCENT forces in the Central Region. Russian tactical doctrine strongly emphasises high tempo operations achieved by the use of tanks and mechanised infantry in mass;[2] supported by a great weight of conventional artillery fire, coupled with a wide range of effective electronic support and countermeasures; and a large quantity of air-to-ground attack sorties.[3]

The Soviet concept is to concentrate their forces for attack in certain sectors across a wide front, using the mobility of armoured forces to advance speedily both day and night, bypassing light opposition. Success in any area is quickly followed up by committing tank-heavy reserve formations as second echelon forces to exploit any local superiority by mounting a breakthrough operation designed to drive deep into the rear areas of the opposition. They recognise that a rate of advance of some 25-45 km per day might be the best they could expect in Northwest Europe against an organised defence in a conventional environment. However, to help them advance, parachute and helicopter-borne troops (supported by light armoured vehicles and self-propelled (SP) guns) may be landed to capture important objectives in depth or draw off reserves.[4]

Over the past decade, the Warsaw Pact has modified and expanded its armoured organisation to the extent that it can now field some 22,000 tanks in the Central Region compared with a NATO total of 4,800. This gives the Pact an overall superiority in tank strength of 4.5:1, although the offensive nature of their operations gives them the initiative to concentrate their forces in selected sectors which, supported additionally by highly mobile reserves, raises this ratio to a ceiling which is probably deter-

mined only by the density that the terrain will support in terms of tactical handling.[5]

What then is our current antitank philosophy and how has it evolved? No facile definition emerges from any of our present pamphlets; nevertheless the numerical superiority enjoyed by Soviet armour presupposes the requirement for a NATO capacity for the rapid destruction of armour. The priorities begin to crystalise: long-range weapons to start the process of attrition as far out as possible; an ability to separate the enemy tanks from his APCS; the requirement for antiarmour weapons capable of a sufficient weight of fire to destroy the large number of vehicles deployed against us; the necessity of concentrating our forces against the main enemy thrust; and the use of local tactical surprise to negate his superiority in numbers.

The Germans recognised these problems during the Second World War and devised the *Schwerpunkt* philosophy linked to a concept of mobile defence in which the tactic of the tank ambush figured prominently, suitably adapted to the terrain depending upon whether it was being applied to the Eastern front or to Northwest Europe.[6] The concept is elaborated in *HDV 100/100 Fuhrung im Gefect*[7] and the tactical sequence has been developed to the point where current techniques envisage a series of decisive counterattacks mounted by strong, armoured mobile reserves to destroy the enemy at a decisive point, usually from the flanks. Since the counterattack is cărried out by a measure of envelopment,. designed to lead to a decisive result through encirclement of the enemy forces, this will inevitably hinge on the frontal force in contact which will in turn necessarily be required to be based upon a strong and somewhat static antitank framework.

You may well say that there is nothing very new in all this; nevertheless, as a primarily defensive concept, it has evolved as a result of a detailed analysis of the exact nature of the Threat. The notion of using the tank purely as a "tank destroyer," albeit as a component of a carefully planned and coordinated antitank framework, is rightly considered as a flagrant misuse of its two main characteristics—mobility and shock action.

At this stage, it might be worthwhile to look at some figures relating to tank losses to various weapons systems.

Table 1 below shows a sample breakdown of British tank losses to German antitank systems in Northwest Europe in 1944.

The figures in table 1 correlate closely to those showing American causes of battle damage to armoured fighting vehicles (AFVs) illustrated in a previous article in the *British Army Review*.[8]

Table 2 shows the relative losses in tanks and antitank guns in 1944 on the Eastern Front.[9]

If one ignores the figures for the 45-mm gun which by 1944 had anyway become obsolete, the aggregate ratio of 2:5 is borne out by comparing the figures for 2d Guards Army of the 1st Baltic Front during the German counterattack at Siauliai between 16 and 29 August 1944, where 469 German tanks were destroyed for the loss of 191 Russian guns.[10] In the 1973 Arab-Israeli War only some 15 per cent of Israeli tank losses were attributed to antitank guided missiles (ATGM), and the majority of these under somewhat untypical circumstances.

to reopen all the old controversies over armoured self-propelled antitank guns. In any case, cost and the present economic climate militate against its introduction to the British Army in the

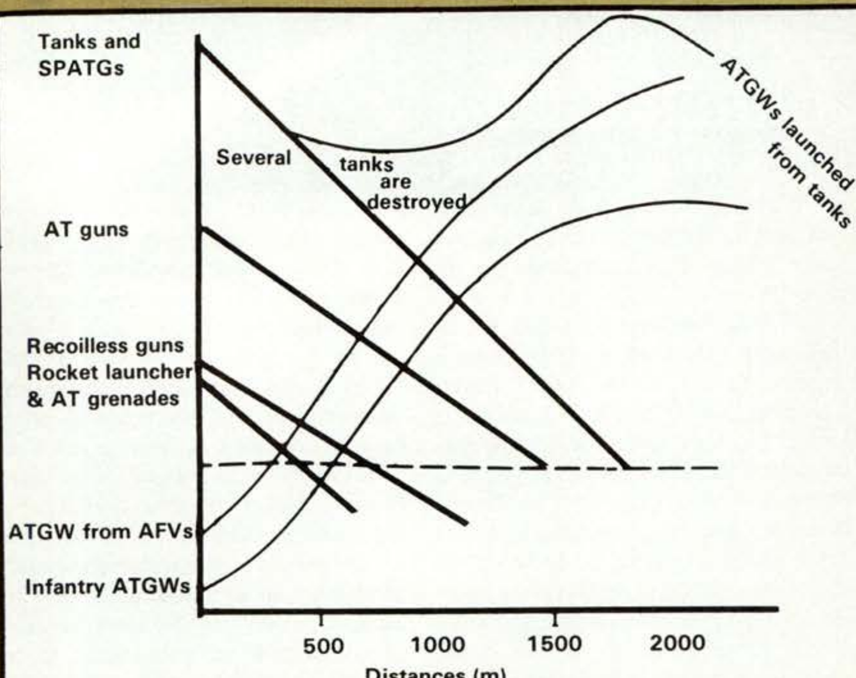


Figure 1. Effectiveness of various means used against medium tanks related to range.

Sample No. of Tanks Destroyed	1305
Self-Propelled Antitank Gun (SPAT)	24.4%
Towed Antitank Gun	22.7%
Mines	22.1%
Tanks	14.5%
Hand-held Antitank Weapons	14.2%
Miscellaneous	2.1%

Table 1

Calibre of Soviet Guns in mm.	Enemy Tanks Destroyed by One Gun before Loss
57	3
76	2.5
122	2
45	0.25

Table 2

near future. However, we have now phased out the antitank gun altogether in favour of the ATGM, and the point at issue is whether recent events and experience, such as the 1973 Arab-Israeli war, really justify this course of action.

Almost before the 1973 Middle-East conflict was over a flood of opinion, both informed and uninformed, poured forth in the media from the pens of the military and pseudo-military commentators.[11] Some of the instant cliches bandied about were:

- ATGMs have made the tank obsolete.
- Low level ground attack will in future be suicidal in the face of the integrated *SAM-6* and *ZSU-23-4* radar-controlled air defence systems.
- Egyptian ATGM deployments looked like a forest of tree stumps!
- ATGM—the new queen of the battlefield.

Time has now allowed a more reasoned analysis of the situation. The tank is still with us; the Royal Air Force continues to practise flying ground attack sorties; the British Army decided (perhaps misguidedly?) not to invest in the *Leopard* or the *Falcon* self-propelled air defence gun systems. But what lessons have we drawn insofar as antitank warfare is concerned and what are the true facts of the matter? No unclassified comparative figures are available as far as I know giving the kill ratio between ATGM and direct fire antitank weapons for the Egyptian Army in 1973. However, it is interesting that Israeli commanders from the Sinai Desert front gave causalty assessments for tanks lost to ATGM ranging from 11 per cent at the lowest to 32 percent at the highest estimate.

What is significant is the fact that the Egyptian General Staff, now that the initial ATGM hysteria has died down, is convinced that the antitank framework should for the foreseeable future continue to be based on a complementary system of ATGM and the antitank gun. It is noteworthy that the Egyptian (and Soviet) infantry antitank gun mix consists of:

T-12
(100-mm) Heavy gun firing mainly hypervelocity, armor-piercing, discarding-sabot (HVAPDS) at 2,000 metres with extreme accuracy and a high rate of fire of between 8-10 rounds per minute (rds. p.m.). It has in addition an high-explosive (HE) capability out to a much greater range.

B-11
(107-mm) Recoilless antitank gun firing high-explosive antitank (HEAT) at 800 metres at 6 rds. p.m. (also with an HE capability).

B-10
(82-mm) Recoilless gun firing HEAT and HE out to 400 metres.

SPG 9
(73-mm) Tripod-mounted rocket launcher firing a HEAT round out to 1,000 metres.

RPG-7V
(85-mm) Hand-held rocket launcher firing a HEAT warhead out to a range of between 300 to 500 metres.

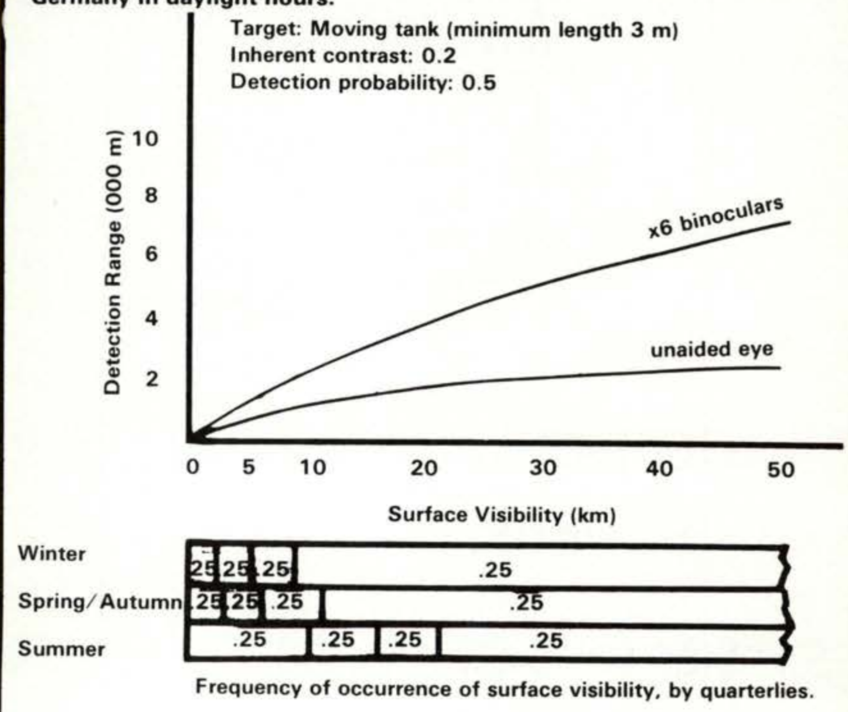
It should be pointed out that the models of Soviet ATGM (*Sagger* and *Swatter*) available to the Arab forces in 1973 were first generation missiles but also that a very large number, vastly in excess of normal establishments, were deployed east of the Suez Canal during the first 72 hours of the war to meet the expected Israeli armoured counterattack. Finally, in accordance with Soviet defensive doctrine, tanks were deployed mainly as an armoured reserve to counter a breakthrough, to counterattack, or to thicken up the forward defences in certain circumstances to redress some local weakness.

Figure 1 is adapted from a Soviet publication[12] and is designed to show the changes in the ability of different antitank weapons to destroy attacking tanks depending upon distance. The graphs are based on characteristics of weapons in service with both Warsaw Pact and foreign armies, and reflect the general principles used to determine the effectiveness of antitank weapons related to the range to target.

On the basis of the diagram, it is possible to determine theoretically the most effective range for engaging tanks; it also shows clearly how the effectiveness of ATGMs against tanks in this respect is the reverse of that of gun systems. At short ranges the gun has an obvious advantage over the missile, not least due to problems of missile collection over the first few hundred metres. The ATGM, however, becomes much more effective as the range increases.

The next question to be asked is whether these longer engagement ranges can be guaranteed. Figure 2 represents a 50 percent detection probability over open ground in Northwest Europe under

Figure 2. Relationship of detection range to visibility in Central Germany in daylight hours.



Frequency of occurrence of surface visibility, by quarterlies.

peacetime conditions (in other words, without the obscuration and distractions of battle).

A cursory examination shows that for 62 percent of the year the unaided eye has a 50 percent chance of detecting a main battle tank at a range of only 1,200 metres or less; this distance is nearly doubled if binoculars are used. To illustrate the implications of this, let us apply a simple "servicing" theory to an example where initially we shall compare the ATGM and the infantry antitank gun in isolation. Assume a defensive position (figure 3), supported by two ATGM launchers and being attacked by a tank company of say 13 medium tanks moving at 20 k.p.h. The tanks are detected at a range of 1,200 metres and it takes 40 seconds for the defender to identify the target and then complete the sequence of events leading up to the actual firing of the weapon (indication, fire orders, registration and so forth). During this time, the range has closed to 1,000 metres. Allowing a rate of fire of 2 rds. p.m. with a kill probability of one tank per two missiles, the two ATGM firing posts will destroy 4 out of the 13 tanks before they get to the minimum range after which the ATGM becomes noneffective. However, at least one and quite probably both launchers will survive the encounter.

Now substitute two recoiless antitank guns for the ATGM, with a rate of fire of 4 rds. p.m. It still takes 40 seconds to evaluate and process the target between the time of detection to the moment the first round is fired, but in this case 5 out of the 13 tanks have been destroyed by the time they are still 650 metres from the position, although certainly one, and maybe both, antitank guns would have been detected and engaged by the enemy.

Whilst the actual casualties inflicted on the tank force vary by less than 10 per cent between the two systems, the significant point is that in the latter case the enemy has suffered a 38 percent loss rate having still 54 percent of the distance to go to achieve their objective; whilst in the former the attrition rate is much more gradual, only reaching 30 percent by the time he has almost achieved his goal.

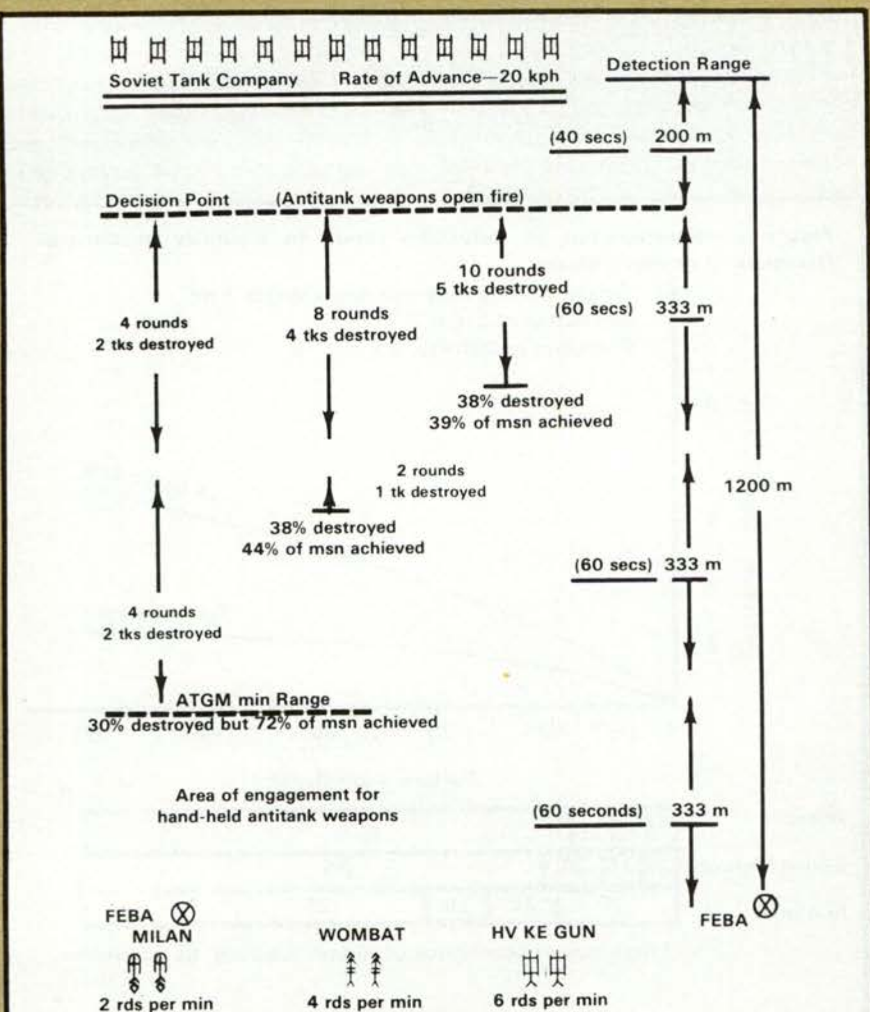


Figure 3

An even more convincing argument emerges by applying two conventional antitank guns to the same situation using a kinetic energy round with a high rate of fire. The defensive commander now has the option of destroying more enemy tanks early on during their advance or waiting until they approach much closer and thereby luring them deeper into the ambush. But if we now take some of the other factors and, like W.S. Gilbert's Heavy Dragoon, throw them into the crucible, a somewhat different perspective begins to emerge. In the dust and smoke of battle the fleeting target will be the rule rather than the exception and this favours the "fire and forget" weapon rather than a semiautomatic command to line of sight (SACLOS) system; furthermore, the ATGM controller will be having to cope with a missile-to-target time of flight problem at the very time in the battle when the enemy artillery concentration on forward defensive locations, and in particular antitank positions, will be at its heaviest.

Perhaps the most important aspect is that for reasons of tactical surprise and maximum fire effectiveness the defending commander may wish to allow the enemy armour to approach to a closer range before opening fire, in which case the tank loss coefficient to the antitank gun will remain the same even if the enemy is allowed to approach to half the original distance, but in the case of the ATGM their losses would be reduced by over 50 percent. This point becomes particularly relevant when considering weapons sited in enfilade.

So what have we gleaned from all this? British military tacticians are at great pains to point out that the lessons from the Middle East must be applied with care to the Northwest European scene, but surely the ATGM is more effectively employed in large numbers in open desert rather than with relatively limited deployment in an urban or semiurban environment or a countryside of woodland and villages. Let us, therefore, examine some of the very practical difficulties which will be experienced in deploying the current range of ATGM in the Central Region at the present moment.

First, the long time of flight precludes a shot at the fleeting target. Enemy tanks are unlikely to remain static and will be obscured by cover or smoke, not to mention the reduction of normal visibility caused by prevailing battle conditions. (Although thermal imaging, image intensification and infrared sights will alleviate this problem to some extent, it appears unlikely that such equipment will be in service before the end of 1983. Added to which the chemical composition of Soviet smoke makes it an effective counter to infrared devices, battlefield radar, and other current surveillance means.) Furthermore, it is hardly conducive to concentration if, whilst trying to fly a missile to its target, the operator is being subjected to a massive artillery bombardment which is likely to coincide with the arrival of the enemy armour at his optimum range for opening fire.

Second is the relatively slow rate of fire compared to a gun. The Threat has dictated the requirement for a high kill rate lest we are to be overwhelmed by speed of advance and sheer weight of numbers. This cannot be achieved with the comparatively small number of MILAN which is at present being allocated to the infantry.

Third are the difficulties of firing at night and the almost insuperable problem of the coordination of white light illumination. (The illumination problem could also reduce the effectiveness of any future night-sighting devices.)

Fourth, training and maintaining the state of operator competence presents another problem. Egyptian *Sagger* operators required 1,000 simulated firings to qualify them, and simulators had to be taken into the field during the campaign so that operators could continue to receive daily practice. Second generation ATGM systems, such as *MILAN* and *Sagger 9M14M,*[13] should certainly see a reduction in the amount of continuation training, although this must still remain a limiting factor.

Fifth, the relatively long minimum range may well prove an embarrassment to infantry operating in close country or where the fields of fire are for any reason generally short.

Finally, wherever a good antitank shoot exists in Germany, the country in between is invariably laced with high-tension electric cables. The effects of these on the trailing command wire of an ATGM can only too clearly be imagined (not to mention its electrified operator!).

Admittedly, the introduction in the next 10 years or so of third-generation weaponry producing technological innovations such as supersonic missiles and improved homing systems will mitigate some of these disadvantages; however, in the short and medium term they exist and this must imperil the overall effectiveness of our antitank defence.[14] Also, whilst discussing some of the tactical difficulties of employment, we have not yet questioned the implications of the expense of such a sophisticated system.

The factors of unit-cost-per-missile, the provision of simulators, and the number of man-hours taken in operator training must inevitably put a limit on the number of launchers it is financially expedient to deploy, and may place a constraint upon the quantity of missiles available for resupply in the field. This might place a question mark over the system's cost effectiveness.

By now, the conclusion towards which we are working must be obvious. There are going to be many occasions when it is neither possible nor practicable for the infantry to have close support from tanks, yet they will be called upon to meet and defeat large numbers of armoured vehicles. To achieve this, any defence will have to be based upon a comprehensive and versatile antitank framework designed to defeat enemy armour at a variety of ranges. Medium artillery, ATGM, and mines are ideal weapons to start the process of attrition out at long ranges. The medium and light hand-held antitank weapons are suitable for shorter ranges.

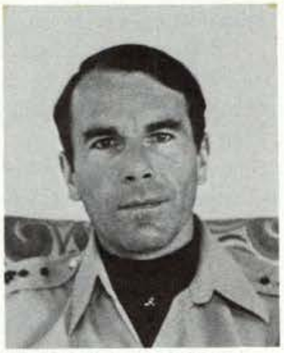
However, what is now required is a complementary system to complete the family in the form of a high-velocity, rapid-fire gun, firing a kinetic energy

(KE) or HEAT round out to a range of not less than 1,500 metres. Remember that the highly effective rapid-fire German 88-mm gun from World War II was capable of knocking out the *Tiger* tank (then the heaviest tank in service anywhere in the world) frontally using a KE round.[15] (The ATGM helicopter has not been considered here since its role and employment is hardly relevant in this context.)

This gun would be an admirable weapon with which to engage the *BMP, PT-76, BTR-60,* and *ZSU-23-4,* over the middle range spectrum; that is to say, from 300 to 1,200 metres. All these vehicles have thin skins and are vulnerable to a KE round of much less calibre than the we postulate. However, there seems to be no reason to suppose that such a weapon may not also be able to disable the *T-62* or *T-64;* certainly the Egyptians seemed well satisfied with the performance of their *T-12* antitank guns when used against the Israeli main battle tanks, considering it to be an efficient and lethal weapon.

Inevitably, the strongest argument thrown up against the introduction of a gun in this era of so-called mobile defence is its very lack of mobility once deprived of its prime mover.[16] If it is argued that the concept of an armoured SPAT is ruled out on grounds of cost and complexity, why not opt for a compromise? The gun could be designed with an integrated auxiliary propulsive system along the lines of the Russian *SD-44*; or it could be mounted on a cheap chassis such as the AMPHICAT. (This latter is a tiny, six-wheel, high-mobility, amphibian with a low silhouette and a unit cost which is considerably less than the conventional prime mover. It would also fit inside a suitably modified *FV 432.*)

To conclude, the emphasis in the "Yom Kippur" ground war lay in the necessity for the Egyptians to defeat a large amount of armour, a situation which is paralleled by the threat facing the Central Region today. The last Middle East conflict saw the massed use of ATGM in general war for the first time; consequently there has followed the subsequent danger that we might be lured into the trap of thinking that new weapons can immediately supersede those current. Study in depth should confirm that they can only be complementary, for new trends are seeded in the midst of existing policies. An imaginative examination of the threat must show that an ATGM system cannot provide an effective antitank defence on its own. Therefore, let us give the infantry back a gun to complement the current ATGM organisation and release the tank to do the job for which it was originally designed.



COLONEL J. HEMSLEY was commissioned from the Royal Military Academy Sandhurst in 1955 into The Somerset Light Infantry. After a period of regimental service, he spent nearly 4 years attached to the King's African Rifles in East Africa. He attended the Defence Services Staff College in India, and has instructed at Mons Officer Cadet School, The Royal Military Academy Sandhurst, and the Army Staff College at Camberley. He commanded a battalion of his own regiment during which it saw service in Northern Ireland and with the United Nations Force in Cyprus. He is currently a Research Fellow at Edinburgh University looking into aspects of Soviet Command and Control, and leaves at the end of the year to take command of 5 Infantry Brigade in Germany.

Footnotes

[1]*The Henderson Society* was formed in 1975 under the chairmanship of Lieutenant Colonel (now Brigadier) J. C. Reilley, DSO, as a forum for discussing military matters of wide general interest. Although based at the Staff College and actively encouraged and supported by the then Commandant, Major General W. G. H. Beech, OBE MC (now General Sir Hugh Beech, KCB OBE MC), it was open to all serving officers and interested civilians. It has now, alas, expired; perhaps a challenge for someone to revive a valuable and much-needed institution.

[2]Dr. W. Joshua, "The Middle East in Soviet Strategy," *Strategic Review,* Spring 1974, p.66.

[3]Colonel I. V. Timokhovich, "*Operativnoi iskusstvo Sovetskikh VVS v Velikoi Otechestvennoi Voine,*" Moscow, Voenizdat, 1976, pp. 106-155. See also Lieutenant Colonel L. M. Hansen, USAF, "The Resurgence of Frontal Aviation", *Strategic Review,* Fall, 1978, pp. 75, 80. This defines the Soviet view of close air support which in no way reflects Western understanding, although air support of ground forces is integral to Soviet doctrine and organisation. Due to the low-level air defence threat from both sides, Soviet fighter ground attack aircraft would probably be employed against tactical depth targets beyond the range of their forward artillery, e.g. headquarters, command and control centres, vulnerable points (VPs), gun areas, logistic and support units, and so forth. It is likely that *Hind* will have a close air support mission in terms of the forward edge of the battle area.

[4]Professor J. Erickson and Doctor E. J. Feuchtwanger (co-ed.) *Soviet Military Power and Performance,* 1979, Macmillan Press, Part 2, Chapter 3, pp.47-73.

[5]Major General V Matsulenko, "Massing of Forces," *Soviet Military Review,* Vol. 2, 1975, pp.54-57. See also *Obschchevoyskovaya armiya v nastupleuii,* ed. Army General A. Kinochkin, Moscow, Voenizdat, 1966, p.34, where he gives examples of battlefield densities from the Great Patriotic War, citing operations in early 1945 leading up to the battle for Berlin where a density of 54 tanks and 268 artillery pieces per km of sector of main attack was achieved within an overall breakthrough sector of 7 km.

[6]Lieutenant General von Manteuffel, *Some Thoughts on the Employment of the Grenadier Division "Groszdeutschland" in the Defensive and Tank Battle of TARGUL PRUMOS (Rumania 2-5 May 1944.* Unpublished paper written in December 1948 (copy held in library of Staff College, Camberley). See also R. E. Simpkin, *Tank Warfare: An Analysis of Soviet and NATO Tank Philosophy,* Brassey, 1979, pp.45-48. Of particular interest is footnote 16". . . General Sir Edmund Fitzpatrick gave a copy of the Manteuffel paper with all maps to the Staff College, Camberley, in 1951. After keeping them for almost 20 years they must have been lent to someone. I have been able to obtain a copy less maps from the Staff College Library." Also particularly relevant in this context are the excellent and penetrating monograph by Steven Canby, *A Comparative Assessment of the NATO Corps Battle,* (Unpublished paper, 1979), and the analysis using the classical Lanchester equation theory made by H. K. Weiss in his paper to the Operation Research Conference and published in *Proceeedings of First International Conference on Operational Research,* pp. 82 - 99.

[7]German Operational Manual, *HDv 100/100 Fuhrung im Gefect,* "Command and Control in Battle," 1973. This is the authoritative Bundeswehr statement of their current doctrine, reflecting perhaps the current adaptation of traditional doctrines.

[8]Captain D. E. King, "Repairing AFVs in Battle," *British Army Review (BAR),* No.52, April 1976, p.41.

[9]G. Biryukov and G. Melnikov, *Antitank Warfare,* Progress Publications, Moscow, 1976, p.42.

[10]*Ibid.,* p.41.

[11]General Chaim Herzog, "The Middle East War 1973," *RUSI Journal,* March 1975, p.13. ". . . . our friends in the media managed to create a great number of legends, and one which they created was that the tank was finished, and that the missile had taken control of the battlefield. In fact, less than 25 percent of our tanks were hit by missiles." He goes on to observe that in a Division which had specially been trained in anti-tank warfare, *not one tank was hit by ATGMs.* (Italics are mine—J.H.)

[12]G. Biryukov and G. Melnikov, *op. cit.,* p.95.

[13]Steven J. Zaloga, *Modern Soviet Armour,* Arms and Armour Press, 1979, p.64.

[14]Colonel J. Hamilton-Jones, "To Seek and Destroy—Guided Weapons Systems," *RUSI Journal,* June 1973, pp.28-34. This article contains an excellent exposition on control and guidance systems (see pp.29-30).

[15]F. M. von Senger und Etterlin, *German Tanks of World War Two,* Arms and Armour Press, 1969, Appendix 3. The German *KWK model 43/71* 88-mm gun would achieve a 90-degree penetration of 134 mm at 2,000 m. Compare figures given by H. J. Jung, in "Feurkraft und Panzerschutz" (*Kampftruppen,* No.5, Sept/Oct issue, 1976). Also the *T-62, T-72 (T-64)* series of Soviet Tanks have a main armament which fires a HVAP (FS) DS projectile effective out to a range of 2,500 metres.

[16]Major Charles M. Baily, "Tank Destroyers," *ARMOR Magazine* (US Army Armor Center, Fort Knox) Vol. 88, No 4, Jul - Aug 1979; pp.7-13.

Recognition Quiz

This Recognition Quiz is designed to enable the reader to test his ability to identify armored vehicles, aircraft, and other equipment of armed forces throughout the world. *ARMOR* will only be able to sustain this feature through the help of our readers who can provide us with good photographs of vehicles and aircraft. Pictures furnished by our readers will be returned and appropriate credit lines will be used to identify the source of pictures used. Descriptive data concerning the vehicle or aircraft appearing in a picture should also be provided.

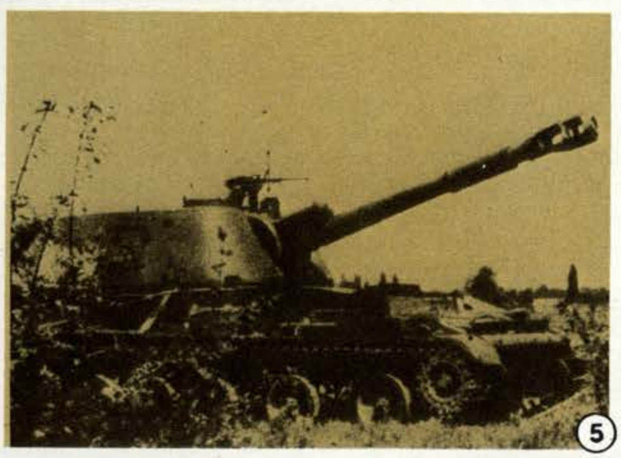
(Answers on page 57)

1

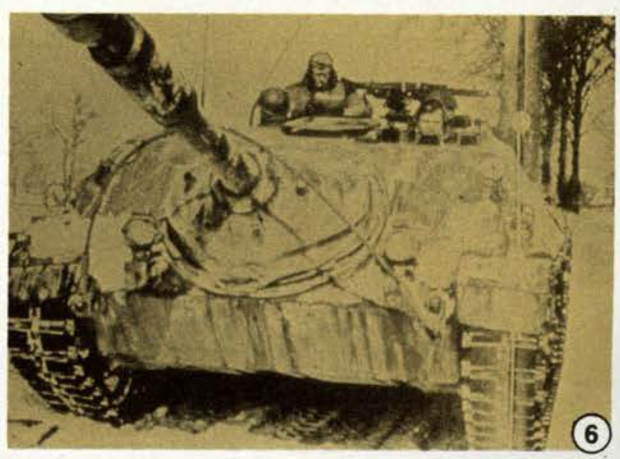
2

3

4



5



6

Sabers at Cress Ridge

by Captain Jeffery W. Woodall

The most unheralded aspect of the Battle of Gettysburg was a climactic cavalry fight fought north of the main battle on the afternoon of 3 July 1863. While overshadowed by the agony of Pickett's charge the same day, this cavalry engagement involved some of the most famous Civil War horsemen. Generals Stuart, Hampton, and Fritz Lee, among others, carried Southern hopes while Generals Gregg, McIntosh, and Custer wore blue along Cress Ridge. When the sounds of battle drifting over Cress Ridge ended, so did the Confederate Cavalry supremacy which had been paramount the 3 previous bloodly years of the war. This supremacy had been weakened at Brandy Station the month before, but at Cress Ridge the determined Union troopers wrecked it, even though the Confederate Cavalry would fight gallantly on against ever increasing odds for 2 more terrible years.

After the Confederate victory at Chancellorsville in May 1863, General Robert E. Lee was more determined than ever to carry the war north in an invasion similar to his aborted attempt the previous year. After reorganizing the Army of Northern Virginia, Lee's army started north around 3 June 1863, with the intent of eventually taking the industrial complex around Pittsburgh, PA. After a slight demonstration in front of Union forces on the 5th, Lee ordered the resumption of the march north on the 7th. General Jeb Stuart was planning on heading north around the 18th as a screening force for Lee's main body, but until then, he continued to reorganize and refit his cavalry force at Brandy, Virginia.

After entertaining General Lee and the local populace at Brandy on 8 June with a parade and mock engagement, General Jeb Stuart, was informed that Major General Alfred Pleasanton had crossed the Rappahannock River with a large Union Cavalry force and was closing in on his cantonment. The surprise by the Union Cavalry was complete, and the Confederate picket support was driven back from the river. Finally rallying, the Confederates fought the Union attackers to a standstill in one of the largest cavalry battles of the war. Pleasanton was forced back across the Rappahannock after suffering 900 casualties out of 12,000 men engaged. Stuart lost some 500 out of 10,000 men. The main result of the battle of Brandy Station was a soaring of morale in the Union Cavalry Corps as a result of finally holding their own against Stuart's "Invincibles." General Stuart's reaction was one of acute em-

barrassment, heightened by a severe dressing down by General R. E. Lee for being surprised. Stuart swore redemption on that "despicable" Yankee Cavalry.

After decamping on the 19th, Stuart started his screen of the Confederate right flank. Stuart's horsemen found themselves increasingly being forced east and north of the Confederate main route, having to contend with Union Cavalry trying to find Lee. This caused Stuart to lose contact with General Lee. Groping his way north, Stuart continuously tried to find Lee's forces. This ride by the Confederate Cavalry leader was quickly becoming one of the most gruelling rides in the whole course of the war. Stuart, who was supposed to supply Lee with intelligence, could not gather enough for his own purposes, though he talked with the civilians he encountered and read every newspaper which came into his hands.

Stuart, one of the most resourceful and aggressive officers in the Confederate Army, was capable of driving his men relentlessly, and this he did now. None had greater loyalty to the Confederate causes than Jeb, and although he had a fondness for gaiety, women, and banjos, he exuded achievement, confidence, and competence. However, in late June, he was having serious doubts about himself and his ability to command as he stumbled north, trying to link up with Lee.

On the night of 1 July 1863, the Confederates finally reached Carlisle, PA, a rendevous point picked by Lee before the campaign started. Stuart learned that Lee was fighting a major battle at a quiet little crossroads town named Gettysburg, and he started south toward Lee.

Stuart has always been customarily damned for his "failures" in his groping ride north; however, several points must be considered. One is that he covered almost 75 miles in 36 hours over 30 June and 1 July, and fought for several hours at Hanover with Union Cavalry. Another point is that with no firm knowledge of Lee's disposition, he turned back south on winded mounts with exhausted troops to ride to Lee's aid. Also, with the massive destruction of telegraph lines during his ride, he effectively caused the Battle of Gettysburg to be fought in a void as the Union commanders were out of touch with Washington most of the time. Also, it must be noted that Stuart's threatening moves outside Washington caused such confusion in the Capitol that reinforcements for General Meade at Gettysburg were slow in being dispatched to his aid. It is true that Stuart's ride around the Federal Army was unfortunate for the South, but there is not a doubt that he had ample authority to make it. He violated no orders. He merely guessed wrong, and in warfare, that is sometimes the worse thing that can be done. If he had not been delayed in route and had maintained contact with Ewell's Corps on that flank, as instructed, he still would have been out of action until the 1st of July and of no use to Lee since Ewell was at Heidlersburg, north of Gettysburg, on 1 July and was also out of contact with Lee.

"Little did anyone realize that this plan would cause a cavalry battle which by numbers involved would be insignificant, but by result would be the beginning of the end of the dominance of the Confederate Cavalry Corps."

Stuart finally made it to General Lee's headquarters at 11:00 p.m. on 2 July. The nearest Lee ever came to reprimanding Stuart for his absence was implied in his greeting to his tired Cavalry commander, "Well, General Stuart, you are here at last."

General Lee's estimate on the night of 2 July of the Union Army was erroneous in the fact he thought General Meade was much weaker than he really was, and that a continuation of the flanking attacks on Union positions on Cemetery Ridge, followed by a massive assault on the Union center by Longstreet, would cause the Union forces to give way. In line with this belief, Stuart was ordered to circle east of Gettysburg to cover the Confederate left and to attack in support of Longstreet's assault on the rear of Cemetery Ridge to envelope the Union forces. Little did anyone realize that this plan would cause a cavalry battle which by numbers involved would be insignificant, but by result would be the beginning of the end of the dominance of the Confederate Cavalry Corps.

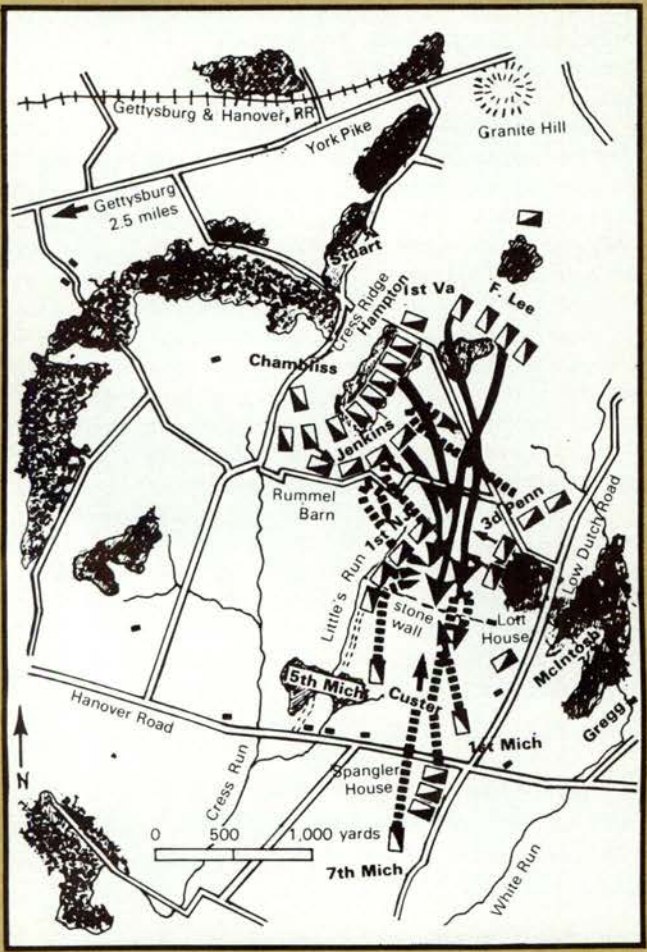
After a few hours sleep, Stuart was up and determined to carry out Lee's instructions to the letter. After sending troopers back to the ordnance wagons for ammunition, a subdued Stuart sat around for 2 hours watching the preparations for the artillery bombardment of Union positions without his usual gaiety. One brigade was new to Stuart's command, the Western Virginia troopers of General A. C. Jenkins. Unfortunately, they were now commanded by Colonel M. J. Ferguson since Jenkins had been wounded during the advance to Gettysburg. This change in command caused undue confusion within the ranks of this already half-disciplined brigade which through some unseen error drew only 10 rounds of ammunition per man. Partly due to the impending artillery barrage, Stuart's Light Horse Artillery had ammunition troubles as well, and General Stuart was forced to start forward around noon without the bulk of it, leaving instructions for the rest to follow as soon as it could fill with ammunition.

"Why Stuart decided to advance with his two best commanders in basically a reserve position has never been determined since Stuart never offered an explanation."

The brigades of Jenkins and Chambliss led eastward on the York Road while Fritz Lee and Wade Hampton were told to follow at a distance in columns. Why Stuart decided to advance with his two best commanders in basically a reserve position has never been determined since Stuart never offered an explanation.

Quickly after beginning his movement, Stuart's progress was picked up by Union forces on Cemetery Ridge and word was carried rearward to General David Gregg, commanding Union Cavalry on that wing. Due to the confusion of the first 2 days, most of the Union Cavalry was awaiting orders along the Low Dutch Road where the York, Hanover, and Baltimore Roads met. Some conflicting orders were in the process of being discussed by senior Union Cavalry leaders when word of Stuart's advance was received, and little or no immediate action was taken to counter the movement until it was hashed out what orders countermanded each other.

The "Invincibles" marched approximately 2 to 3 miles out on York Turnpike without ever encountering any Federal troops. Their route led through heavily populated farmland



with fields divided by 3 or 4-feet tall stone fences and clumps of thick woods. The most prominent man-made features were huge barns, some of which were two stories high. Officers had trouble keeping their troops' shirts on as the temperature climbed. Heat waves shimmered across the cultivated fields. This seemingly lack of discipline was caused partly by the leisurely pace of the march and the lack of enemy sightings. An almost holiday atmosphere prevailed as the troops unwound from the frantic pace of the past few days. Turning to his right onto a country road, Stuart led his troops to "a commanding ridge which completely controlled a wide plain of cultivated fields stretching toward Hanover on the left, and reaching to the base of the mountain spurs among which the enemy held positions."

Stuart halted his lead brigade on the ridge, Cress Ridge, and observed that its northern approaches were heavily wooded and would allow him to advance unobserved by enemy scouts or pickets. Dominating the open field below him, some 300 to 400 yards away was a huge barn known locally as the Rummel Barn. Stuart decided Cress Ridge was an ideal place to position his force since he could shield General Ewell's left, observe the vulnerable rear, and turn the Union flank if he desired. Also, General Stuart was very pleased with his disposition since he could see most of the roads which led to the rear of the Union positions, and the open fields gave him maneuver room in case he was challenged.

Jeb hid his forces in the woods until they were masked from observation from the Rummel Barn area. The area along the ridge was marked by an almost unearthly stillness, even while only 3 miles away two armies faced each other and prepared for the climactic death struggle atop Cemetery Ridge—of them, no sound was heard.

After completing the positioning of his troops, General Stuart's next move was bewildering to his staff and troops. He called forward one of his artillery pieces to the edge of the woods and personally ordered it to fire one air burst round in three different directions. The shells burst over the empty landscape. Was this some perverse kind of artillery registration or was it, as one member of Jeb's staff believed, a signal to General R. E. Lee that the cavalry was in place? Possibly General Stuart hoped to entice the Federal Cavalry into a fight in order to recoup some of the prestige that had been lost during the haphazard advance to Gettysburg. No one knows since General Stuart never explained his action; however, one thing is for sure—he announced his exact position to the Union Cavalry. Another mystifying note adds credence to the fact he was trying to draw out the Union Cavalry. Immediately after the firing, he sent couriers back to Fritz Lee and Hampton and told them to come up quick, but to stay hidden as much as possible south of Cress Ridge. He told his staff that if things worked out, they would soon make an unopposed assault on the rear of Cemetery Ridge and the Union Infantry there.

Unknown to General Stuart, General G. A. Custer, after a conference with the Union Cavalry Commander (General Gregg), decided to draw the "Invincibles" out to fight. Custer believed by drawing Stuart out for the kill, he would be in position to "save the Army of the Potomac." He accomplished this by withdrawing his forces back past the Spangler Farm on Hanover Road, which pinpointed Union forces for the Confederates. General Stuart, seeing the movement, deployed a dismounted battalion of Ferguson's command and ordered them forward to occupy a defense line which was centered on Rummel's Barn and ran along a stone fence. It appears Ferguson was to be Stuart's "bait" in drawing out the Union Cavalry.

"The 3d Pennsylvania Cavalry tried to again cut the Confederate line at the Rummel Barn, but again Chambliss counterattacked, this time mounted, slamming the enemy cavalry units together into a pile-up of men, horses, and flashing sabers.

Stuart then moved Chambliss' brigade to the right rear of the dismounted force. Ferguson's troops were barely in position when General Gregg dismounted and deployed the 1st New Jersey Cavalry of McIntosh's command on a line around the Lott House approximately 1,000 yards to the front of Ferguson's troops. General Gregg then sent the 3d Pennsylvania and the 1st Maryland Cavalry to the woods behind and to the right of the 1st New Jersey. Alarmed by the Confederate troopers around the Rummel Barn, McIntosh advanced the 1st New Jersey and elements of the 3d Pennsylvania to a line midway across the open field in front of Cress Ridge, stopping them along a branch of the Little's Run Creek about 500 yards from the grey line. Simultaneously, General Gregg had his artillery open fire on the ridge causing Stuart to pull his artillery back off the ridge to keep them from being disabled. However, before the move was complete, the Confederates lost two guns.

After directing the movement of his artillery, Stuart is

reputed to have remarked to a staff officer that "they were not the only troops under fire" since the noise in the distance was growing to a crescendo as the artillery duel was intensified along Cemetery Ridge in preparation for General Pickett's fatal charge.

It was approximately 2:30 p.m. Pickett and his 15,000 men would step off to glory in less than 30 minutes. Suddenly, bluecoats on foot poured over the wall around the Rummel Barn and overran the Ferguson's Confederate line in several places. A hot firefight ensured, but Ferguson was able to drive the 1st New Jersey back about 10 yards when the fire suddenly slackened and died. Ferguson's troopers had fired their 10 rounds and were out of ammunition. Stuart quickly directed Chambliss to reinforce (a move he had not wanted to make, but the ammunition shortage almost caused the loss of his "bait"), and his charge drove the enemy back about 200 yards. The dismounted firefight lasted about 45 minutes longer.

The first mounted troops suddenly appeared on the field as the 3d Pennsylvania Cavalry tried to again cut the Confederate line at the Rummel Barn, but again Chambliss counterattacked, this time mounted, slamming the enemy cavalry units together into a pile-up of men, horses, and flashing sabers.

The Union force retired. Just as the Federals retreated, Wade Hampton and Fritz Lee arrived with their brigades. Stuart had wanted initially to position Lee and Hampton to the south of the Ridge, generally along Hanover Road to encircle. However, the Ferguson situation forced otherwise. Hampton was positioned to the left of Chambliss while Lee took up position with his right flank tied to Hampton's left, and his left pointed toward Low Dutch Road. The Confederate line now took on the appearance of a capital "L", with the long axis pointed back toward Gettysburg. Stuart directed Fritz Lee's 1st Virginia to ride south, then to cut in east of the Federals holding along Little's Run and to roll up their flank. This assault was met by Custer's 7th Michigan Cavalry who halted and dismounted at a stone fence which ran from the run to the vicinity of the Lott House. Custer held for about 10 minutes until Lee was reinforced by Hampton's 1st North Carolina and the Jeff Davis Legion who forced the wall and drove the Federals back, scattering them. This grey tide was unable to exploit since flanking rifle and artillery fire was so intense it caused their retreat.

"Custer dashed to the front, waving his hat, and cried, 'Come on, you Wolverines!' and with that, the Union forces exploded forward toward the advancing 'Invincibles.'"

About the time Pickett's charge was breaking on the heights of Cemetery Ridge, Stuart decided to end this fight once and for all, and drive the Union Cavalry from the field with a mass charge. All of Hampton's and Lee's forces were to be used, and the route to be used was the same one Lee had just traveled. In one of the cruelest examples of fate of war, General Gregg came to the same conclusion as General Stuart and started to rally his forces for a mass charge.

An unknown Federal officer says the "Invincibles" were "in close column of squadrons, advancing as if in review, with sabers drawn and glistening like silver in the bright sunlight—the spectacle called forth a murmur of admiration from the Union ranks." Cries of the Confederate officers could be heard over the silent advancing ranks—"Keep to the saber!" repeated over and over again. The saber was not a favorite weapon of the grey troopers who preferred pistols and shotguns instead. However, during Brandy Station, the month before, the Confederates learned the value of the saber at close range.

General Gregg rode over to the 1st Michigan and formed them and the 3d Pennsylvania at close columns and ordered them to charge. Custer dashed to the front, waving his hat, and cried "Come on you Wolverines!" and with that, the Union forces exploded forward toward the advancing "Invincibles." The two columns drew nearer and nearer, the Confederates outnumbering their opponents about three to one. The gait increased—first the trot, then the gallop. Hampton's and Stuart's battle flags floated over the van of the grey mass. Intensive artillery fire tore gaping holes in the grey ranks, but they quickly closed.

A Pennsylvanian, Captain Miller, remembered, "As the two columns approached each other, the pace increased. A fearful howl was heard from the grey lines, when suddenly a crash like the falling of timber betokened the crisis. So sudden and violent was the collision that many of the horses were turned end over end and crushed their riders beneath them. The clashing of sabers, the demands for surrender, the firing of pistols, and the cries of the combatants now filled the air." By other witnesses, it was best described as a "wild saber-swinging melee!"

"Stuart would write that the Yankees 'vanished' before his charging cavalry 'like grain before the scythe,' while Gregg would report that, 'Defeated at every point, the enemy withdrew.'"

By now the rest of the Federal Cavalry stormed from the woods to attack the Confederate flanks, cut off the rear of the grey line, and drive it back. The 3d Pennsylvania tried to charge Stuart's Horse Artillery on Cress Ridge, but was disabled and scattered by its fire.

The flanking attacks on his line forced Stuart back toward Rummel Barn, and he decided to withdraw back to his original positions. General Gregg then ordered Custer to break off his pursuit and fall back. Since he yet feared a Confederate counterstroke, they, too, stopped at their original positions.

The fighting had been fearful. Some of the dead were found in pairs of blue and grey, pinned to each other in death by tightly clenched sabers driven through each other's bodies. Mr. Rummel, owner of Rummel Barn, while dragging off dead horses the next day, found beneath one a Virginian and a Pennsylvanian: "Their fingers, though stiff in death, were so firmly embedded in each other's flesh that they could not be removed without the aid of force." Among the severely wounded was General Hampton who had a shrapnel wound in the side and a saber stroke to the head. General Stuart had two saber cuts and three bullet holes in his coat, but was unmarked.

After darkness, Stuart withdrew back up York Pike toward Gettysburg, leaving the 1st Virginia Cavalry to screen along the ridge. Union Cavalry was too cut up to pursue.

The Battle of Cress Ridge was the last great saber battle of the war in which cavalry alone participated. Casualties had been severe with Stuart losing 181 troopers and Gregg 252. Neither side had been decidedly defeated—both would claim victory. Suart would write that the Yankees "vanished" before his charging cavalry "like grain before the scythe," while Gregg would report that "Defeated at every point, the enemy withdrew." General Custer was mentioned in Gregg's report and cited for gallantry in action.

"Although overshadowed by Pickett's charge on Cemetery Ridge, Cress Ridge was definitely the ending of an era—that of large battles among pure cavalry units."

The battle of Cress Ridge can provide some valuable lessons for modern tactical leaders, even though it was fought 117 years ago. By modern standards, the weapons employed were primitive; however, the tactics were not. There is not a lot of difference in the tactics of today and those used at Cress Ridge—only the lethality of modern weapons has modified them.

There is little doubt General Stuart made several fundamental mistakes in his tactical plan and handling of the engagement. At the beginning, General Stuart was given, by modern standards, conficting orders by General Lee. Two missions were given—first, an active screen or a covering mission of the Confederate left flank, and then a deliberate attack on the rear of Cemetery Ridge and the Union positions there. This attack was to support Longstreet's main thrust on the Union center. The transition from the screening role to the attack role would have required a massive amount of coordination between Stuart, Longstreet, and their higher headquarters for the timing of the two attacks to be effective.

According to the historical references available, it does not appear that Stuart ever discussed the tactical plan with Longstreet. Also, Stuart never tried to clarify with General Lee the apparently conflicting and dissimilar orders, nor did he ever attempt to remain in contact with either Lee or Longstreet throughout the battle. If only a feeble attempt had been made by General Stuart to contact General Lee's headquarters during the battle, the engagemet of Cress Ridge would not have been fought since with the changing Confederate situation on the main battlefield, it would have served no purpose for Stuart to force an attack on Meade's rear, and General Lee, under these circumstances, would not have wanted to throw away badly needed cavalry forces needlessly.

General Stuart's own tactical employment of his forces deserves some critical examination since it must be noted that the Confederates outnumbered the Union forces at Cress Ridge, and yet were fought to a standstill. It must be noted that even though Stuart's movement to the Union rear was initially picked up by the Union Cavalry, their nonaggressiveness allowed Stuart to pass unnoticed to positions on Cress Ridge. The tactical surprise that Stuart enjoyed was quicky given up by his firing artillery from the Ridge, for no apparent reason. His tactical, numerical superiority was negated by never concentrating his forces in enough strength at the battle's critical point, the final charge, in order to influence that outcome. This appears to have been because Stuart almost had Ferguson overwhelmed while Ferguson was acting as the "bait," and he had to commit Chambliss to reinforce. This effectively removed both Ferguson and Chambliss from the final active phases of the battle. But did it need to? Even though Ferguson was out of ammunition, his force still could have mounted a saber charge against the Union forces holding Little's Run while Chambliss could have moved in his support or attacked mounted across the open area to assault Union Cavalry in front of the northern portion of Low Dutch Road. This also would have freed Hampton and Fritz Lee to have attacked up Hanover Road and forced the Union Cavalry to face either encirclement with probable heavy losses or to withdraw and open up Meade's rear.

The worst tactical shortcoming by the Confederates was the total lack of reconnaissance. This lack of reconnaissance led to the Battle of Cress Ridge being a pure meeting engagement, fought in an information void on both sides. No reconnaissance was tried before or during the fighting. No effort was made to determine flank limits, weak points in the enemy line, nor even enemy strength. This caused Stuart to have to react continuously to enemy pressure without benefit of needed planning, which caused him to waste time and resources. Additionally, this also gave the Union Cavalry time to counter its moves. Basically, due to the lack of reconnaissance, Stuart gave up speed and lost surprise.

The fact remained that Stuart's threat to Meade's rear was repulsed. However, that did not matter because the Confederate assault on Cemetery Ridge by Pickett's gallant men had bled to death on its forward slope. Never again would the Confederate Cavalry Corps be the same. Its confidence and *esprit de corps* were badly shaken by the stand of the Union troopers below Cress Ridge.

The losses of able leaders and troopers hastened the Confederate decline. The Confederate Cavalry was now a defensive force; they would fight well in the last 2 years of their existence, but the offensive elan would be missing. Stuart would meet Custer again at Yellow Tavern, and the results would be catastrophic for the Confederate cause. Although overshadowed by Pickett's charge on Cemetery Ridge, Cress Ridge was definitely the ending of an era—that of large battles among pure cavalry units. The glory of the early years and of Cavaliers wheeling horsebound armies in charge and countercharge was gone—only the bloodletting continued.

CAPTAIN JEFFERY W. WOODALL received a Bachelors Degree from Kansas State University in 1974. He served with the 82d Airborne in various platoon positions, and with the 24th Infantry as tank company XO, mortar platoon leader, S-3 Air, and tank company commander. He was scheduled to begin Armor Officer Advanced Couse in October 1980.

SOPLC
A Maintenance Course for Senior Officers

by Lieutenant Colonel David R. Titus

Although their rank, experience, and branch of service vary widely, all students of the Senior Officers' Preventive Logistics Course (SOPLC) have one thing in common—they are all on their way to important command and staff assignments and have been away from troops and equipment for as much as 7 years.

The 9-day SOPLC provides refresher training in logistics and maintenance management and is conducted 17 times annually at the U.S. Army Armor Center, Fort Knox, with the assistance of the U.S. Army Materiel Development and Readiness Command (DARCOM).

There are some 1,400 Army graduates annually from the course from the Active Army, the National Guard, and the Army Reserve. Additionally, the Marine Corps sends about 176 officers through a 4-day course that is conducted in conjunction with the first week of the Army course. Included in the Marine contingents are U.S. Navy Medical Service Corps officers who are attached to the Marine Corps. Several Air Force officers have also completed the course.

Marine Corps Command and General Staff College students spend a week at Fort Knox undergoing the Marine SOPLC, and foreign students at the Army C&GSC spend their final academic week in a shortened SOPLC. Command designees of combat support, combat service support, and training commands attended an abbreviated course called "How to Maintain Week," which was a part of the Senior Commander's Orientation Course. However, this week of training was phased out in favor of branch "system-peculiar" decentralized training.

The need for the SOPLC was first recognized in 1957. A study by the Army Maintenance Board revealed that the Army wasn't getting the expected use out of its equipment and that there was a need to improve maintenance. General Maxwell D. Taylor, then Chief of Staff of the Army, in a letter to the Commanding General, Continental Army Command, reaffirmed his decision to develop a Senior Officers' Preventive Maintenance Course and said "I appreciate very much your letter of 19 June recommending that the Senior Officers' Preventive Maintenance Course not be established and outlining your reasons therefor. Because of the view expressed, I have carefully reviewed the justification for this course." General Taylor then listed the names or positions of several general officers who supported the establishment of the course and quoted one of them as saying, "Many officers of all grades are either ignorant of the basic principles of maintenance or have an impractical academic attitude toward this important problem. A definite need exists for giving appropriate instructions in preventive maintenance befitting the grade and potential future duties of the student."

Fort Knox was selected as the site of the course, and the Armor School formed the Maintenance Management Department and began training officers 13 January 1958.

Instructors for SOPLC are carefully selected. The materiel instructors are technically qualified experts in the materiel of the commodity command they represent. The senior logistics management instructor has an advanced, logistics-related degree from an Army Logistics Management Center Program. A Marine supply officer is also assigned to provide Marine-peculiar logistics management instruction to Marine students. All instructors constantly update their instructional areas of responsibility and subject knowledge and points of contact in the respective sponsoring commands.

The academic aspect of SOPLC covers the Army

maintenance system, maintenance records, inspection standards, equipment readiness criteria and materiel readiness, and command and staff responsibilities for maintenance. During the latter phase, seven significant factors affecting maintenance are covered, including command/supervision of personnel, time, repair parts, tools, test and diagnostic equipment, publications, and facilities.

The logistics management instruction is given in a classroom/theatre environment that provides a setting for skits presented by the instructor group. Other instruction includes discussion and conference conducted by the management instructor staff and presentations by logistics—oriented guest speakers. There are 32 hours of management related instruction in the following subjects:

	HOURS
Command and Staff Management	5
Publications	2
Inspections and Standards	2
Military Standard Data System	1
Army Supply System	5
Army Maintenance System	6
Property Accountability	2
Dispatch and Transport Management	1
Subsistence Management	1
Logistics Readiness	6
Financial Management	1

Other guest speakers discuss additional management-related areas such as organizational effectiveness, the DARCOM Logistics Assistance Office, DARCOM Materiel Readiness Support Activity (MRSA), and the Materiel Readiness Report, which DARCOM uses to identify and correct Army equipment readiness/maintenance problems worldwide.

DARCOM materiel subjects are taught in 12 classrooms, referred to as the "shops." Each contains representative materiel provided by DARCOM subordinate command, which support equipment preventive maintenance indicator demonstrations by the instructor and group discussions.

Students spend 20 hours in the shops examining the common items found in their units. The inspection stresses criteria called preventive maintenance indicators which are deficiencies that point to areas of maintenance that require command emphasis.

This system of indicators is based on the belief that the commander cannot and should not personally detect and correct the mechanical deficiencies. Instead, he should be concerned as to why the condition exists, and what should be done to preclude a future deficiency. He should relate the deficiency to one or more of the seven factors affecting maintenance and take action as his analysis indicates.

As an example, a broken rearview mirror on a ¼-ton truck points to several factors. Untrained personnel may have failed to detect or report the condition. Maybe time was not available to replace it; perhaps the replacement part was not available. Further checking may reveal that it was requisitioned some time ago, but the requisition has not been filled for some reason. Thus, the problem may be related to the factor of "repair parts," and that area requires attention. Correcting the failure in the repair parts supply system may then eliminate more faults than just the broken mirror. The indicator was merely the place to start looking.

The example of a broken mirror is simple. The detection of deficiencies on radios, generators, air compressors, missiles and tanks can be difficult without the proper training.

Twenty hours are spent in the preventive maintenance indicator inspection techniques and the instruction and practical exercises are broken down as follows:

	INSTR HRS	PE HRS
Armament Materiel	4	1
Communications-Electronics Materiel	2	1
Tank-Automotive Materiel	3	1
Missile Materiel	1	0
Troop Support Equipment Materiel	3	1
Aviation Materiel	2	0
Medical Equipment	1	0
TOTAL	16	4

During the practical exercise, students inspect equipment, find faults, and relate the fault to one or more of the factors affecting maintenance. In the critique, the solution that is proposed relates to the entire maintenance program rather than just correcting the fault found.

Throughout the course, skits and practical exercises place the students in the role of the 25th Armored Division commander and the course ends with a simulated critique of a division field training exercise. The critique stresses improvements in unit readiness that can be achieved through good maintenance and logistical management.

In summary, officers who are being assigned to command or staff positions after several years away from troop duty, should attend this valuable course.

LIEUTENANT COLONEL DAVID R. TITUS was commissioned in Ordnance upon graduation from Idaho State University in 1963. He completed the Ordnance Officer Advance Course in 1969, received a Master of Science degree in Education from the University of Southern California and is a graduate of C&GSC. He has served as a supply platoon leader, forward support maintenance company commander, and in logistics staff/advisory assignments in Vietnam, Taiwan, and Iran. He is currently Chief, Ground Mobility Division of the Maintenance Department, US Army Armor Center, Fort Knox.

PROFESSIONAL THOUGHTS

Combat Assault Vehicle

The tank is essentially unchanged since World War II except that in the case of American armor the weight has gone up considerably. The *M4E5/M4-B* (circa 1945 at the tail end of the war), for instance, mounted a 105-mm main gun, the same caliber as on the *M-60.* The Germans also introduced the *Jagtiger* during the last months of the war. It mounted a 128-mm cannon—and that was a third of a century ago. This is not to say that improvements have not been made in every part of the tank from the engine to the ammunition for the main gun. Nevertheless, cross-country speed, trafficability, and effective protection from current antitank weapons remain relatively the same. Even as new and thicker armor has been utilized, enhanced tank cannon ammunition has been developed to defeat it. Furthermore, highly effective aiming devices coupled with accurate inertial sensing and guidance systems for both shell and antitank missiles weigh the scales against the tank. The point has been reached, perhaps passed, wherein there is anything to gain by fabricating tanks with larger bore cannon and heavier armor. As with most other inhabitants of the battlefield, vulnerability (in the tank's case to antitank weapons) above a certain protection threshold, must be accepted. The jeep, after all, has served as a reconnaissance vehicle for years without protection being added. Its vulnerability is accepted, yet it is able to operate, with reasonable prudence, in the active battle area.

It is logical that the tank can be redesigned to reduce its weight, fuel consumption, crew, silhouette, signature, and cost, while increasing its mobility (speed, manueverability, and trafficability), rate of cannon fire, and range. Considering a smaller main gun, say a 75-mm, we could have an automatic cannon (the 75-mm *Skysweeper* antiaircraft gun, circa 1950s, was rapid fire and automatic). Lesser gun caliber would allow smaller ammunition which would permit a greater number of rounds to be carried. Ammunition would also be easier handled because it would be smaller, lighter fixed rounds. Cannons of smaller caliber, with the improved ammunition available now, are capable of defeating tanks in the current inventory. Additionally, antitank missiles can also be part of the tank armament. The smaller tank would be more difficult to hit and would afford the same protection as the present heavier tanks, e.g., from artillery, grenades, small arms, antipersonnel mines, rockets, etc., but not, of course, the heavy antitank stuff—no different than the *XM-1* or the *T-72.*

All of what has been said in itself is interesting, although certainly not revolutionary. However, let us go one step further; marry up the infantry and the tanker in an assault machine. If this bears a resemblance to the Russian *BMD,* you are right. This assault machine that I would call the Combat Assault Vehicle (CAV), melds the infantry fighting vehicle and the tank. It is capable of destroying enemy tanks with both its automatic cannon and antitank missiles. There would be a three-man operating crew: commander, gunner, and driver. The infantry squad would man integral machineguns and their own automatic rifles through gun ports in the sides and rear. This vehicle would weigh between 15 and 20 tons. It would be easily air transportable and perhaps even air droppable in an airborne version. Here we have a concept vehicle (a reality in the Soviet Army) that has many advantages over the standard tank, as a tank. It would even make possible the mechanization of airborne forces. As a CAV it melds tank and infantry into a tight knit homogeneous element organized as such—all part of a CAV unit. Here is machine warfare at its apex with heretofore two separate combat entities—infantry and armor—joined together to operate a single machine of war. The infantry specialists in the CAV would provide not only firepower and close-in protection, but act as outriders, scouts, or foot assault elements as required. The possible combat leverage factor of this concept is awesome.

The Soviets think so highly of this idea that they have translated it to another system—the helicopter. They have produced the *MI-24* (*Hind-D*) attack helicopter which, although heavily armed with a 12.7-mm Gatling-type gun, rockets, antitank missiles and possibly an automatic grenade gun, carries a crew of three and also a squad of infantry with their equipment. While it may seem that I am one of those who is always pointing to our adversary's way of doing things, painting them 10-feet tall, and slavishly extolling their ways, I am not. Not to consider what other countries are doing in a given field is stupid. To adopt an attitude of "Not invented here," is dangerous ethnocentricity.

The Soviets are no slobs when it comes to equipment design or innovative ideas. It was the USSR military who pioneered in airborne operations when parachute troops were used in the extensive Kiev maneuvers during 1936—4 years before the U.S. organized its airborne test platoon. In Russia, the Germans were confounded by the *T-34,* probably the finest tank produced during World War II.

In the case of the Russian *BMP,* this is a light vehicle, an upgunned infantry fighting vehicle (IFV), not a true tank as it is too light. NATO is also improving its infantry combat vehicles mounting 20- and 30-mm machine cannon on the new families of IFVs, specifically the German *Mardar* and the U.S. IFV. The proposal here is to take the last step, as it were, and place infantrymen within the "tank" of a regular ground division. This tank would be much stouter than present IFVs, but lighter than present medium tanks.

Suffice it to say that these technological and doctrinal innovations will have a great effect upon battle tactics. Likewise, Army organizational changes will also come, but that is not within the purview of this article.

Remember the heavily armored knight who was jousted from his horse and easily slain by a yeoman wielding a battle axe against a relatively immobile foe who lay on the ground unable to effectively fight.

ANDREW M. RUTHERFORD
Colonel, Infantry

Combined Arms Operations— Ours versus Theirs

Since the introduction of the tank to the modern battlefield, the United States Army has trained and stressed the need for combined arms operations. This paper will address in limited terms the U.S. Army's application of the combined arms technique with major emphasis on the Soviet techniques of combined arms.

To discuss combined arms, we must understand what the U.S. Army definition is. AR 310-25, dated 1 June 1979, defines combined arms as, "more than one tactical branch of the Army used together in operations." At division level, it is the tailoring of brigades to provide proper combat power to accomplish specific types of missions. These brigades are given armor, mechanized infantry, engineer, and artillery units for those specific missions.

Once the brigade has received its mission and units to be used, it tasks organizes the battalions into combined arms units. The armor battalions and mechanized infantry battalions are cross attached by brigade under the combined arms technique.

At battalion level, the U.S. Army has habitually task-organized into combined arms teams. AR 310-25 defines combined arms teams as a "team of two or more arms, each supplementing the other's capabilities by aiding the forward movement of the team through the employment of its own special capabilities; usually consisting of tanks, infantry, engineers, and artillery."

When U.S. Army combat battalions task organize for combat, certain problems occur. The greatest problem is at team level where the same type platoons, i.e., infantry platoon attached to a tank company, may not be from the same unit each time. The company commander must adjust to the new platoon and the new platoon must adjust to the company. Standing operating procedures (SOP) may be entirely different for the attached platoon. At battalion/task force level similar problems occur when the battalion receives engineers, air defense artillery (ADA), and other combat support elements. Each unit has a different SOP, and, therefore, must make close coordination with the gaining unit to insure proper understanding.

Highly desirable is that a gaining commander know the personalities, capabilities, and limitations of the unit he gains. If this were possible, numerous problems in combat could be eliminated.

We have only addressed problems that occur in the command, control, and communications area of a battalion/task force. Besides these problem areas, task organizing also creates logistical problems, primarily within Class V and IX and vehicle recovery. For example, mechanized infantry units neither have the capability to maintain tanks nor have the organic assets to resupply attached tank units with additional ammunition. Readily apparent is that task organizing for combat as practiced in the U.S. Army present definite problems.

These problems have been eliminated by the Soviets in their task organization at regimental level. If we inspect the Soviet motorized rifle regiment in detail, we see that the Soviets have attempted to alleviate the problems that have hindered us.

The motorized rifle regiment consists of three motorized rifle battalions, one tank battalion, one artillery battalion, one air defense artillery (ADA) battery, one antitank guided missile (ATGM) battery, one reconnaissance company, plus an engineer company, and a signal company. Other combat service support assets are also organic at regimental level. The motorized rifle regiment is a compact combined arms unit.

In this configuration, the regiment can and often does operate independently of the division. Soviet doctrine stresses the use of combined arms, with a multiplicity of weapon systems, to insure the greatest chance of success on the battlefield. A motorized rifle battalion can normally expect to receive a tank company, engineer, ADA, and other nonorganic assets. Habitually, motorized rifle companies will receive tank platoons when conducting either offensive or defensive operations. These tank platoons constantly train with the same motorized rifle companies. The battalion receives the same tank company in combat or during training. This truly simplifies the combined arms problem.

A noted Soviet author Colonel A. A. Sidorenko in his book *The Offensive,* states, "During the Great Patriotic War, the combat capabilities of combined arms *soyedineniye* (refers to corps, divisions, or a brigade) constantly increased. This was the result not only of their available forces, but also of varied means of reinforcement which the *soyedineniye* received for combat."[1] As you can easily see, this experience from World War II has had a definite effect upon the Soviets.

The combined arms technique is used constantly by the Soviets. In an advance guard formation, it would not be uncommon to see the motorized rifle battalion plus one tank company, on ATGM battery, one artillery battalion, one engineer platoon, and one ADA platoon of *ZSU-23-4s.* The tank platoons of the tank company would be broken down into the other three motorized rifle companies.

The Soviets believe that this type of organization will allow the battalion commander to seize the initiative during the offensive. The constant training of these units of the motorized rifle regiment establishes a standard SOP. Battalions of the regiment know exactly what companies of the tank battalion they will receive. Likewise, the company commanders of the battalion know which platoons and the personalities of the platoon leaders they will receive.

The motorized rifle regiment of the Soviet motorized rifle division is truly a "combined arms unit." There is nothing in the U.S. Army's Tables of Organization and Equipment with the exception of the cavalry squadron and regiment to match it. Close scrutiny of the motorized rifle regiment is necessary. This tactical organization could be used as a building block for U.S. organizations. The resulting reallocation of assets within the U.S. Army could hypothetically increase the number of

[1]A. A. Sidorenko, *The Offensive,* trans from Russian by the U.S. Air Force, (Moscow 1970), p. 74.

maneuver divisions. Combined arms techniques will be necessary for any future war.

The invasion of Afghanistan on 27 December 1979 has demonstrated how quickly the Soviets can move several motorized rifle divisions. The Soviet type organization may truly be a solution to our organization problems for future combat missions.

The motorized rifle regiment is a completely packaged combined arms unit, which can carry out independent actions from its parent division. Tanks, infantry, artillery, engineers, reconnaissance, chemical, medical, and transportation units do one thing. They provide its commander with a combined arms regiment.

R. W. NALL
Major, Armor
Fort Polk, LA

Realistic Training

At this point, my tenure in Europe has been one of constant frustration and little job satisfaction. I am frustrated. Some of my reasons for discontent follow.

As an Armor Officer, I have a primary interest in seeing that the tank's weapon system is not only used effectively in combat, but that the training road be realistic and practical. The present European Gunnery Program, although it has improved in the last year from a program of shooting the most tanks the quickest to one where some consideration is being given to crew duties, still has room for improvement.

Gunnery ranges that require the coordination between tank crews and their leaders have now deteriorated into test situations where all answers are known beforehand. Too often commanders, for the prestige of high gunnery scores, are not only encouraging their crews but publishing the answers in the form of type of target, type of ammunition to use, and target ranges. This not only destroys the purpose of the gunnery program but leaves a false sense of accomplishment. This type of training is no longer a challenge, and tank crews think it is much the sport. I, therefore, propose a more realistic training program.

A good test of a unit's capabilities would be evaluated if the unit, during a practice alert, moved without prior notification or training preparation to a qualification range for their particular weapon's system. The advantages to this system are many.

The present gunnery training program is not sustained throughout the year. Unlike an athlete who trains all year to reach a peak at competition time, the gunnery program is usually active only 2 or 3 weeks prior to actual firing. I believe a no-notice, move-out would put tank gunnery at the priority level it belongs and increase our effectiveness in the event of hostilities.

Monthly alerts are fairly predictable despite all that is done to make them realistic. What is beneficial to having to perform a move-out each month? Nothing! Our soldiers, despite the best efforts of all concerned, move to the alert areas unprepared for a long maneuver. The soldier/athlete comparison is applicable in this situation as well. No athlete if asked to meet the same standards time after time will excel in his/her sport. The soldier knowing there will be monthly alerts will only do what is necessary to satisfy the requirement.

A program should be developed to innovate the present alert concept so as to implement training in conjunction with alerts. If this procedure is too costly, think of what the cost would be to move out for a practice only to find the alert to be a reality. For example: Czechoslovakia, 21 August 1968.

Another problem area is that of medical support battlefield. The present use of *M-113s* to remove wounded soldiers is not adequate. The vehicle does not provide sufficient protection to allow them to navigate over large areas from place of injury to the battalion/squadron aid station. In addition, my experience has been that these medical personnel are only fairly acquainted with map reading procedures. When we have major command maneuvers, medical support is never put into play and seldom considered. Its purpose during these maneuvers is for emergency situations. Yet there exists an opportunity both in time and circumstance to exercise the same procedures which would be used in the event of an European War.

Almost all of us are familiar with the steps taken to evacuate a disabled tank and return it to a level of support maintenance that is able to fix the vehicle. This is done during all field problems and is fairly routine. The evacuation of wounded soldiers, specifically sending our medics to locate the imaginary casualty and returning with him to the battalion/squadron aid station, is not practiced.

Since battalion/squadron-size elements will have to displace several times during a 24-hour period in order to avoid being artillery targets, our medics should become much more familiar with map reading procedures—they are not. The straight and predictable battle lines will not be present in the next European War. Instead, there will be salients of resistence causing our mobile medics to have to locate our moving aid stations while trying to avoid enemy territory.

The urgency of getting a wounded soldier to medical help is obvious. A wounded soldier if he does not receive competent medical help may soon die. A damaged tank will still be a damaged tank regardless of how long it sits on the battlefield.

Tank gunnery and medical support are situations that I have observed during my European tenure which need to be addressed and corrected. A vast amount of information is available that if taught and practiced by our forces would increase the standards of our present training program and put our forces on a sounder footing in the event of hostilities.

JAMES R. ROWLAND
Captain, Armor
1-1 Cavalry

Communicating

Hopefully, the kinds of things which establish the bottom line in any systemic approach leading down the pike toward optimizing understanding is, except for a few caveats, maximum utilization of minimum language. Or, expressed differently, understanding comes from clear, concise communication.

Any of the above *buzz words* sound familiar? Some are very much in use. Others date the user. Most, if not all are questionable English—verbal void fillers.

Hopefully. This misused nonadverb dominates spoken and written expression in American life. It is meaningless and reflects nothing more than overexposure by most users. Imagine the effect of, "Hopefully, I shall return." Better still, posterity would have been forever stirred by, "We have met the enemy and they are ours, hopefully." Why is such a significantly senseless word used to abuse? Maybe it has replaced the defunct, "ya know." An entire nation seems to need a verbal qualifier; an expressed reservation; an out. Could our's be "God Willing" without violating the First Amendment?

Bottom line. A few years ago Dick Van Dyke starred in a film about a midwest town whose populace decided to quit smoking. Throughout the picture Bob Newhart addressed gatherings of executives and repeatedly used *bottom line* for comical emphasis. It was so artificial, so very phony that the comedian was guaranteed laughter every time the audience heard it. Perhaps the origin of these words trace back to accountants. Trudging through figure after figure they draw a line, jot down the net profit after taxes and underline it twice. At last. *The* bottom line. Reflect upon the detraction from General Marshall's tribute had it been altered to read:

> The Soldier's heart, the
> soldier's spirit, the
> soldier's soul are everything. . .
> It is morale (the bottom line)
> that wins the victory.

Systemic. This word is coming on strong and is causing much confusion. Do those attempting to use it ever consider the intent or meaning conveyed? One dictionary explains, "Of, or pertaining to a system or systems." The same source defines systematic as, "Carried on in a step-by-step procedure." Do you suppose that *systemic* has become the erroneous replacement for *systematic*?

Down the pike. That stilted phrase is resurrected occasionally. *Up* can be substituted for down. Road replaces pike for moldy freshness. Emphasis required? Insert *coming* before any mix of words. *Coming up/down the pike/road* goes back two decades in origin and somehow, rightfully belongs there.

Optimizing. Bureaucrats are optimizing every government program which has not already been maximized or minimized. Academicians, the media, the business community all hold the word in such repute that it could be used by Newhart in another routine. Do not misunderstand. There is a place for optimize in our language. However, overuse has nullified it. Admiral Dewey, given the right exposure, might have shouted, "Damn the torpedoes! Optimize speed!"

Caveat. The staff traditionalists still hang on to that stale word. It is the password of the Whiz Kids era. Hopefully, it will soon die of old age or be retired with its users.

Utilization is all-Army's first team. That old soldier will never die even though *use* may be substituted from time-to-time only to be changed by the *wordsmiths* (another word on the rise).

Kinds of things. Now that's a real grabber. The words sound better if given the proper, humming, nasal inflection. A Pentagon contemporary once called. He kept using *kinds of things* so often that, for sanity, an interruption was demanded. "Just what *kinds of things*? What are you talking about?" Believe it or not, there was a long pause while the winded jargoneer searched for an answer. It was as though his crutches had been kicked away and he was waiting to fall. The phrase should be better immortalized. But consider this verse:

> Kind of this,
> Kind of that,
> Work it in,
> To each that.
> And when engaged
> in intellectual flings,
> Stuck for words?
> Try-*kinds of things.*

At this point, you may rightfully question the appropriateness of such a subject in ***ARMOR.*** Why not here where expression is straightforward? Contributors to this professional journal epitomize sound, acceptable military writing. If you will, they tell it like it is without pompous or excess wording. This writing is an effort to emphasize a personal belief that our language is betraying us. We are coming across to our troops in particular and the public in general as Madison Avenue windbags. Recently, the Army Chief of Staff aired his views about a gathering to consider the management of leadership. Whether or not he miscontrued the purpose of the meeting which was apparently erroneously advertised, one fact was very clear in his rather pointed message. He told it like it is. We would do well to follow his example. Getting back to basics by injecting some simple sincerity into our expressions might be a good start.

THOMAS H. FLETCHER
Lieutenant Colonel, GS
Fort McPherson, GA

NEWS NOTES

Advanced Armor Vehicle Evaluation

Since July 1980 the U.S. Army Combat Developments Experimentation Command (CDEC) at Fort Ord, CA, has been assisting the U.S. Marines in a Department of Defense test called Advanced Antiarmor Vehicle Evaluation (ARMVAL).

Using realistic tactical scenarios, the ARMVAL evaluation consists of a number of two-sided, force-on-force experiments. These are designed to evaluate the contribution of lightweight combat vehicles (LCVs) to the effectiveness of forces engaging in combat missions.

To make this assessment, friendly combined arms forces conduct combat operations, first using current antiarmor systems to obtain baseline data, and then with the LCVs substituted for current systems.

The "enemy" forces use conventional tanks and simulated Warsaw Pact weapons systems to try to counter the punch of the friendlies and their LCVs. In addition to LCVs the Marines are using their own *LVTP-7* amphibious personnel carriers. Both forces are composed of both Army and Marine Corps personnel.

Major issues of the test include an analysis of the contributions the LCV can make to force effectiveness on the battlefield, and, will LCVs—which trade off heavy armor protection for high agility and mobility—be survivable as members of combined arms forces on the battlefield?

The U.S. Army Tank Automotive Research and Development Command (TARADCOM) has modified ten *M-551 Sheridans* to give them greater speed, mobility and agility. The LCV is a lightweight vehicle with an improved suspension system, high horsepower-to-ton ratio and advanced fire control. It achieves its light weight by being lightly armored. The LCV weighs only 13 tons, about half the weight of an *M-551 Sheridan*. It can go from a standing start to 30 miles per hour in 7.5 seconds and can reach speeds up to 60 miles per hour.

A lightweight combat vehicle (LCV) fords a Fort Hunter Liggett, California, creek during the ARMVAL test. (U.S. Army photo by SSG Bob Hubbert)

For ARMVAL, the LCV does not have a main gun. Instead, each player fires a low-power, eye-safe laser, with computer simulations representing a high velocity 75-mm cannon.

The collected data and the experience gained through planning, instrumentation, conduct and analysis of this test may provide for a future Joint Operational Test and Evaluation Phase for an LCV as technology evolves. ARMVAL will contribute significantly to the LCV validation process and provide data to support future decisions concerning possible lightweight antiarmor development programs.

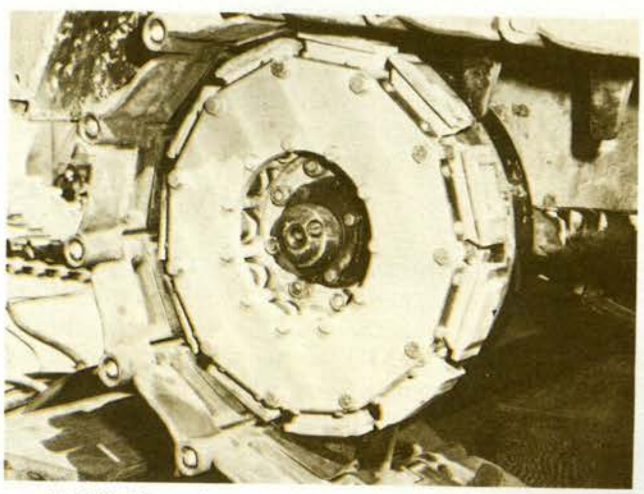
The field execution phase is scheduled to end in mid-December, 1980.

M-113 Noise Reduction

Research is underway to reduce the track noise of the *M-113* armored personnel carrier. The noise, produced by the track passing over the idler sprocket, the drive sprocket, and the road wheels, can lead to a loss of hearing and hampering of intercrew communications, as well as making the vehicle easier to detect by enemy forces.

Initial efforts concentrated on the idler sprocket, the greatest source of noise. An experimental idler fitted with rubber pads to absorb vibrations reduces the noise generated by the track and idler interaction by 75 percent.

Further efforts to reduce track noise are being directed at the drive sprocket, the second greatest offender. Possible application of the concept to heavier tracked vehicles, such as tanks, will also be studied.



(Photo courtesy of APG News.)

OPMS - EPMS ARMOR

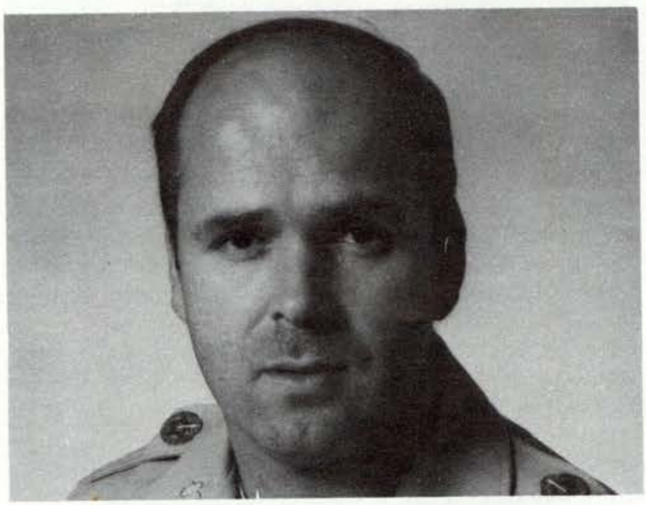
EPMS

New Branch Chief

Lieutenant Colonel Robert Graham is the new chief of the Infantry/Armor Branch at MILPERCEN, replacing Lieutenant Colonel John S. Walker, who departed for battalion command in Alaska.

Graham is an Infantry officer who has served as platoon leader, company commander, battalion advisor, battalion operations officer and battalion executive officer. He has also worked as Plans and Assignment Officer with V Corps; Adjutant of the 1st Brigade, 3d Armored Division, and most recently as a member of the MILPERCEN Personnel Management Assistance (PERMAS) Team.

ROBERT C. HORROCKS
Master Sergeant, USA
Armor Career Advisor



Branch Chief Comments

As your new Branch Chief, I assure you that we in the Infantry/Armor Branch will continue to accomplish our mission of assigning and managing Infantry, Armor, Ranger and Special Forces enlisted soldiers in accordance with Army priorities and policies. All possible consideration will be given to the Professional Development and personal requests of each soldier. There will be times when the overriding rationale for a decision must be Army priorities or policies. In these cases, we will respond as quickly as possible and provide you with the reasons for our decision. We will continue to use these Career Notes to pass on items of interest, and information concerning your professional development as Armor Crewmen.

LTC ROBERT GRAHAM

Tactical Communication Chief Course (MOS 31V30) Upgrade

On 15 May 1979, the Communication/Electronics Department, U.S. Army Field Artillery School, Fort Sill, OK, began to analyze and evaluate the existing Tactical Communications Chief Course. Although this course is taught at the Field Artillery School, its graduates may be assigned to any of the combined arms units. Comments from the field and students showed the course to be too closely structured to the Communications Electronics Staff Officer Course (CESOC) to benefit optionally the enlisted supervisor. Analysis of 1512 active Army TOE's showed that the person occupying the 31V30 duty position did not have feeder-MOS duty soldiers (MOS 31V10, 31V10F7, 36K and 05B) assigned by TOE to assist him. This shortcoming occurred as follows:

- 82 percent did not have an 05B10.
- 95 percent did not have an 05B20.
- 33 percent did not have a 36K10.
- 87 percent did not have a 36K20.
- 33 percent did not have a 31V10.
- 93 percent did not have a 31V20.

Based on this data, an evaluation board consisting of Signal School, USAFAS, and III Corps Artillery Signal NCOs and signal officers convened in November 1979 determined that the 31V30 was the actual "doer" rather than a supervisor in a significant number of cases.

Based upon the board's findings, the Tactical Communication Chief course was redesigned and developed for the NCO in the field. Brigade and Division mission was minimized, and emphasis was placed on the battery (company communication chief, battalion wire chief, and battalion communication chief). In keeping with this "working" concept, tactics and theory were decreased approximately 80 percent and replaced with 48 hours of basic electronics and an increase in systems evaluation and maintenance.

OPMS—U.S. Army Reserve

Site-Support-Tours-in ADT Status

A request to support Annual Training sites, ROTC Summer Camp, and other training related activities for up to 179 days in ADT status requires the PMO to maintain a roster of officers who, because of flexible work schedules, are available to fill those positions. IRR officers who have such flexibility should notify their PMO as to dates and length of availability. Selection of officers to fill requirements is based on grade and specialty skill identified for the position. Additionally, the PMO will take into account the frequency of similar types of tours the officer has performed in past years. The OPMS-USAR objective is to provide a balanced and comprehensive range of training opportunities to all members of the IRR.

BOOKS

SHERMAN: A HISTORY OF THE AMERICAN MEDIUM TANK by R. P. Hunnicut. Line drawings by D. P. Dyer and color drawings by Uwe Feist. Foreword by General I. D. White, USA (Ret). Presidio Press, San Rafael, CA 94902. Nearly 1,500 illustrations. $45.00

The *M-4, General Sherman,* was introduced to combat by the British during the great battle at El Alamein, October 1942. Nearly 40 years later, a few *Shermans* are still in service.

Mr. Hunnicutt has authored the ultimate book on the technical development of the *Sherman.*

This is not a book on the historical armored battles in which the *M-4* was involved. Neither does it concentrate on the controversies that surrounded the development of a medium battle tank prior to World War II nor the heated debates that ensured over modifications to the *M-4* during World War II.

What Mr. Hunnicutt has done superbly is to take you through the evolution of the medium tank that traveled along two parallel paths between the two world wars—the conventional full-track designs of the Ordnance Department and the convertible wheel of track arrangement proposed by J. Walter Christie—then, to World War II, where we were without a suitable tank until early 1942 when the first production models of the *Sherman* rolled off the line. ly

After tracing the development of the *M-4,* Mr. Hunnicutt devotes considerable effort to detailing the numerous modifications to the *Sherman* to improve its fighting capabilities and to describing the variants of the *Sherman,* for example self-propelled artillery, tank destroyers, flame-thrower tanks, and mine-clearing tanks. He concludes *Sherman* with a discussion of its postwar service and an excellent reference data section.

By the end of World War II, 50,000 *Shermans* of various models and variants had been built, a tribute to the versatility and combat effectiveness of the *M-4.*

When one condsiders the painstaking research that was required to write this book and the more than 500 pages complete with hundreds of pictures and detailed diagrams, the cost of the book is a bargain to anyone interested in tank development.

The bible of the *Sherman's* technical development, production, and modifications, has now been written.

ARMOR Staff

YESTERDAY AND TODAY: A DICTIONARY OF RECENT AMERICAN HISTORY 1945 TO THE PRESENT by Stanley Hochman. McGraw-Hill, New York, NY. 407 pages; illustrated. $19.95

This work presents a fascinating source of information on the pop-culture of the United States since World War II. The author has a somewhat curious method for arranging some of his entries. For example, the entry "First Women's Bank" appears under "F" but not under Women's Bank, nor does he list any other "firsts." The "Pumpkin Papers" entry tells us to see "Alger Hiss Case" but the entry is under "H" and not under Alger. This inconsistancy in alphabetizing is helped somewhat by the index, but the cross references are not listed. Aside from these quirks, the book should prove a valuable reference for phases, events, persons, etc. of modern times and is just plain fun to browse through. Who were the "twelve grayhaired guys named George"? (Nixon's 1968 cabinet) What was the "Turnip Congress" and why was it termed such? (1948 special session of Congress called by Truman). A trivia lover's delight.

WILLIAM H. HANSEN
Fort Knox, KY.

MANOEUVRE, produced by Zipporah Films, Inc., 54 Lewis Wharf, Boston, MA 02110. Running Time: 115 minutes. 16-mm, black and white.

ARMOR does not normally carry reviews of movies, but an exception is made in this case because this documentary should be of interest to the military community. Ed.

The film covers the participation of a tank company from Fort Polk, LA in a REFORGER Exercise.

Manoeuvre follows the company through its aerial deployment to Germany and the drawing of prepositioned

tanks and equipment. It then documents the company's march to a defensive position from which it repels an enemy attack and goes over to the offense.

There is no narration to the film other than the voices of the officers and men as they go about preparing plans, issuing orders, and fighting mock battles.

The entire film was made on location at Fort Polk and in Germany. When no admission is charged, the one-time rate for screening the film is $100 for nonprofit agencies or civic organizations.

ARMOR STAFF

STRATEGIC IMPLICATIONS OF THE ALL-VOLUNTEER FORCE: THE CONVENTIONAL DEFENSE OF CENTRAL EUROPE, by Kenneth J. Coffey, University of North Carolina Press, Chapel Hill, 1980, 210 pages. Paper, $9.00.

This book analyzes the impact of the decision to abandon the draft in favor of an All-Volunteer Force on US force structure and our capability to defend Central Europe conventionally. It begins by reviewing the events that led to elimination of the draft. This enables the reader to understand that this decision was based on domestic political realities, not strategic considerations. Consequently when the author proceeds to a discussion of the strategic policy and force structure changes that have been made in recent years, the reader can also see why these changes have been necessary. This section is especially interesting because the author discusses all the controversial, topical issues such as our increased reliance on reserve forces; the increased number of women and blacks in the force and of course, the quality of new recruits and the extent to which they are representative of our society.

He continues with an explanation of the problems that we would face in a "worst case" conventional war between NATO and Warsaw Pact Forces in Central Europe. He starts by focusing on the Army's manpower problems, particularly its inability to field trained unit fillers or adequate numbers of casualty replacements. He ends by considering the impact of our serious resupply and transporation shortcomings.

This is the strongest section of the book. The author's assumptions and the scenario he depicts ring true. Consequently, it is difficult to dispute his conclusion that the Army no longer possesses the manpower, transportation and equipment resources to sustain a conventional war in Central Europe.

Not surprisingly the book closes with a discussion of what could be done to change this situation. A few of the proposals that are made, such as cross-leveling Army, Navy, and Air Force Individual Ready Reserve assets, illustrate not only how serious our manpower problems really are, but the need to look beyond conventional wisdom for possible solutions.

This book is definitely worth reading. Overall it tends to represent the *pro* side of the restore-the-draft debate. Nevertheless, the book is well researched, concise, and yet comprehensive in its analysis of the results of recent decisions concerning defense manpower. It raises discussion of these problems above the visceral level by logically presenting facts to support the conclusion that our national readiness has been undermined by All-Volunteer policies. And while many soldiers may already be familiar with these problems, a thorough reading could assist in developing a clearer understanding of their collective impact on our ability to respond to a war in Central Europe.

L. ERICK OHLSSON
Major, GS
MILPERCEN

MIG PILOT by John Barron. Reader's Digest Press, McGraw-Hill Book Company, New York. 220 pages, photographs. $10.95.

"Belenko estimated it all should be over within the next 6 hours. At age 29, he would be either dead or reborn in a new world."

So begins the tale of Lieutenant Viktor Belenko, who piloted his *MiG 25 Foxbat* to a landing in Japan on September 6, 1976. The book paints the exciting, suspense-filled picture of Belenko's defection, as he brought one of the Soviet Union's most closely guarded military secrets to the West. The work continues with a description of his adaptation to life in the United States, and the wonder of discovering an entirely new, unknown world.

Besides being an honest-to-goodness thriller, complete with the suspense of a man's final desperate flight to freedom against all odds, the book has a more subtle side. Through flashbacks of Belenko's thoughts superimposed on anecdotes of his life in the Soviet Union, it traces an intelligent man's own discovery of the falseness of the Communish Party's picture of the world. Bit by bit, small cracks appeared in the altruistic vision of the Soviet Union. Eventually, when Belenko was cut off by impending divorce from his last ties to the now-exposed fraud of life under Communism, he decided to flee.

Another vital part of this book is the intimate description of Soviet life by a typical "successful" citizen—one who had reached the most honored and prestigious level of Soviet society. For example, Soviet factory life is portrayed as a boring tedium punctuated with heavy drinking both on and off the job. Job quotas could be filled by noon; and quotas were not exceeded, because that would only increase quotas. Each harvest involved a major mobilization of all elements of society—including the fighter squadrons, and often ended in a huge wastage of foods already in short supply.

The final element of the book is the fascinating picture of Belenko, with only the Communist Party's description of western life to guide him, learning to live in the United States. Everything was new, and he was suspicious of it all. He had been told that the western masses were starving; hence, the opulence of the first American supermarket he visited could have been nothing but a showplace unavailable to the common citizen. The clothing store must have been a similar ploy. How could so many suits be gathered in one place, with only a few clerks to watch them? And how could people be allowed to travel wherever they pleased without anarchy overruning society?

All in all, the book offers an exciting, easily-read adventure. But it also provides several deeper images. Intimate glimpses of life in the Soviet Union emerge, providing an alternate look at the "worker's paradise." More importantly, we get a refreshing look at our own lifestyle as seen by someone who had never experienced our freedoms before. By viewing ourselves through his eyes, we can regain the pride and wonder of our blessings of freedom and prosperity. Perhaps it is only through such eyes that a society, complacent in its own well-being, can see again how truly lucky it is.

FRAME J. BOWERS, III
Captain, Armor
USAAEFA, Edwards AFB

SUEZ: THE DOUBLE WAR, by Geoffrey Powell and Roy Fullick. David & Charles. 1979. $22.50.

In the summer of 1956, the revolutionary dictator of a Moslem "Third World" country (Gamal Abdul Nasser of Egypt), eager to repudiate the vestiges of Western imperial control and encouraged by Soviet aid, suddenly and unex-

pectedly seized control of property seen by the West as vital to its economic life (the Suez Canal). The offended Western powers, Great Britain and France, chose to react with military force.

Their reaction was hampered by political division at home, by lack of preparedness to deal quickly with a Third World foe located at a distance from their bases, by lack of support from their allies, and finally by their economic vulnerability—particularly to the threat of an Arab oil embargo. Does any of this sound familiar? In the end, the resulting Suez expedition proved a fiasco especially for Britain, and greatly reinforced the standing of Nasser. The Suez expedition is a classic failure; it is from that point of view that Roy Fullick and Geoffrey Powell examine it in their book, *Suez: The Double War.*

On the face of it, the book suffers from a number of defects. At least one of the authors participated as a paratroop company commander in the fighting, but, as the authors note in their Foreword, the whole subject will have to be reviewed when the archives open. They interviewed many of the officers involved in planning and running the expedition, and they used the published memoirs of the principal participants in the political conception of the operation; but their attempts to summarize the Eyptian, American, Israeli, Russian, and even French, points of view leave much to be desired. The book reads very well and has good maps, but there is only one photograph—inexcusable in a book on this subject, and all the more so for a book that lists at $22.50! So, the book is flawed, and certainly does not represent solid historical research, but it is well worth reading anyway.

In less than 200 pages of easy reading, the authors manage to convey much of the political duplicity of the Western governments, particularly the British; the authors reveal a military machine caught flatfooted and unable to mount a *swift* response, and then they show that that military machine lost further precious time by laying on an operation reminiscent of D-Day in its cumbersome complexity. Most important, the authors demonstrate how these political and military failings not only cost the allies their chance for success, but how these failings sapped the morale of the troops and ruined the credibility of the governments. (Again, primarily the British government).

Were I a member of the Carter administration, I would find this book worth reading. Were I a soldier in the United States Army, I would want to read this book. What it has to say—tentative as it may be—is worth pondering. The reader may or may not agree with the authors that the Suez crisis marked the beginning of the decline and fall of Great Britain as a great power, but I know of no book which better illustrates the consequences, particularly on troops in the field, of fundamental political and military mistakes. Let us learn from the mistakes of others; it is so much cheaper than having to learn from our own.

JEFFERY A. GUNSBURG
Major
Assistant Professor of History
Virginia Military Institute

THE SAGA OF IRON ANNIE by Martin Caidin. Doubleday & Company, Inc. Garden City, New York 1979. 243 pages, 172 photographs. $14.95.

The pages of *The Saga of Iron Annie* put the reader in the copilot's seat of one of the most remarkable aircraft ever built while Martin Caidin traces the plane's colorful history and describes its near demise and eventual restoration.

"Iron Annie" is the only JU-52/3m aircraft remaining in the world out of the thousands and thousands that were built in Germany. Her past is a story that encompasses the growth of commercial aviation, wartime flights through the winter skys of Russia, air charter service in South America, abandonment on a jungle airstrip, and a restoration project that cost the author $350,000 over a 2-year period.

Caidin amuses, sometimes thrills, and always entertains the reader with his accounts of the astounding, often dangerous, and even miraculous flights he and others make in "Iron Annie" as they bring her back to life.

The book is written in an easy-going, often humorous style that makes it enjoyable reading for the earthbound as well as those who are fortunate enough to be pilots. Caidin includes enough technical data concerning the restoration to please the avid aviation buffs and his historical research into the aircraft's history and use is excellent.

The Saga of Iron Annie is far more than just another story about re-building an airplane. Caidin has not only written a book—he has created as adventure.

R. R. TAYLOR, JR.
Lieutenant Colonel (Ret)
Racliff, KY

Recognition Quiz Answers

1. **U.S. *M-88A1*** armored recovery vehicle. Drive sprocket in rear and 6 road wheels. Suspension similar to M-60 with torsion bars; shock absorbers on roadwheels 1,2, and 6 on each side. Hydraulically-controlled blade on front used to anchor vehicle when winch or boom is used. A-type boom (in folded position) can lift up to 25,000 kg (55,000 lb) with the blade down.

2. **Soviet *GUS*-class air cushion vehicle.** Two propellors mounted at the rear for forward propulsion, two vertical stabilizers with horizontal stabilizer halfway up. Shown in use with Soviet Naval Infantry (Marines) in an amphibious assault.

3. **U.K. *Scorpion*** armored reconnaissance vehicle with 76-mm *L-23* gun. All-welded aluminium hull with 5 roadwheels per side. Engine and drive sprocket in front. Three-man crew consists of driver, commander and gunner. *Scorpions* have been fitted with 90-mm guns, *Swingfire,* TOW and HOT ATGM systems, APC, ambulance, command, and recovery configurations have also been put in service.

4. **U.S. *UH-60A Blackhawk*** utility helicopter. Carries 3-man crew and up to 11 infantrymen and their associated combat gear. Can also carry up to 8,000 pounds in an external sling.

5. **U.S.S.R. *M-1973*** 152-mm self-propelled gun/howitzer. Appearance similar to U.S. *M-109.* Six roadwheels per side, with wider space between first and second, and second and third wheels. Large armored turret mounted at rear of hull, and muzzle brake fitted to gun. Maximum range with conventional HE is about 24,000 meters, and rocket-assisted projectiles can reach 37,000 meters. Can also be used in the direct-fire role. In service since mid-'70s with Soviet army.

6. **German *JPZ 4-5 Jadgpanzer Kanone*** self-propelled antitank gun with 90-mm gun. Gun is mounted in glacis plate, and slightly offset to the left of the centerline. It has an elevation of +15°, depression of −8°, and can be traversed 15° left or right. a 7.62-mm MG is mounted coaxially to the main gun, and another 7.62-mm MG can be mounted at the commander's or loader's station for antiaircraft defense. Expected to be withdrawn from frontline service in the early 1980's.

Armor Magazine Index—Volume LXXXIX, 1980

TITLES

AUTHORS

BOOKS

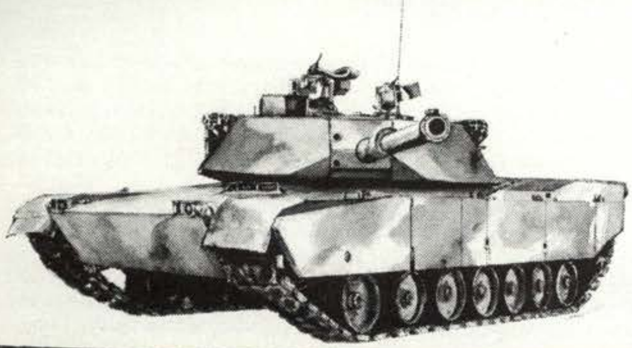
BRIEFS

DEPARTMENTS

NOTES

PROFESSIONAL THOUGHTS

RECOGNITION QUIZ



THE ARMOR DESK

Lee, Marion, Kearney, Stuart, and Sheridan, Crook, Pershing, and Patton—they are legend. But it is you, the Cavalry "trooper," the Armor "tanker" who made them so.

The Continental Congress constituted our nation's first regiment of light dragoons on December 12, 1776. Your history is a saga of daring raids, grueling battles, and arduous marches. Your story is intertwined with the story of our nation's growth and change.

You served with distinction at King's Mountain, Cowpens, and Guilford Court House. You fostered a tradition that still lives.

Service on the Plains seemed glamorous to some, but life was harsh. Nevertheless, you proved that if the West was to be conquered, the Cavalry "trooper" was the one for the task.

You campaigned in Mexico. And then that most dreaded of all human conflicts engulfed the nation—Civil War. You helped save a nation.

You were not to know the leisurely garrison life of peacetime. The country pushed westward. Your lot was a constant struggle against nature and the Indian. Finally, your carbine, your will-to-fight, your aggressiveness, your reckless but ordered discipline prevailed. The West was won.

Cuba. The Philippines. Tropical heat, malaria, yellow fever, you suffered through them all. But your spirit never faltered and you provided the Army with some of its finest traditions of valor and determination.

And as you chased Pancho Villa during the early 1900's, little did you realize that the war that was beginning in Europe would forever change your mount.

You rode into combat in a roaring, clanking, metal monster called a tank. The days of your beloved horse were numbered.

Through the thirties, you trained and learned to use and care for new equipment—armored cars, halftracks, and light tanks.

December 7, 1941. Again you were caught up in war. North Africa, Europe, the islands of the Pacific. You served with distinction and honor.

Then Korea. You fought in terrain that was not considered tank country, but you fought well.

Vietnam—a war that divided our country. But you brought a new dimension to ground combat—the airmobile assault, the attack helicopter.

Today, you are part of the volunteer Army, the National Guard, and the Reserve. The total force! Your future is sound. You eagerly await new steeds—the Abrams tank, the cavalry fighting vehicle, and the attack helicopter. They will serve you well in the "Combat Arm of Decision."

Your heritage and spirit began in Cavalry. It lives on today in Armor. The spirit of the attack, the shock of armor firepower, the will-to-fight, and the ability to close rapidly with the enemy rest today and in the future with you—the Cavalry "trooper," the Armor "tanker."

Our nation's freedom is dependent upon you.

ARMOR salutes you on your 204th birthday and wishes you much success and happiness in 1981.

FWS

2D ARMORED CAVALRY

(Second Dragoons)

2d Armored Cavalry

The color of the facings of the old dragoon regiment was orange, which is used for the field of the shield; the insignia was an eight-pointed star of gold, two of them (conforming with the numerical designation) are placed on the shield. The traditional episode in the regiment is the charge of Captain May's squadron on the Mexican artillery at Resaca de la Palma, which is commemorated by the principal charge on the shield. The crest is self-explanatory.

Constituted 23 May 1836 in the Regular Army as 2d Regiment of Dragoons and organized with Headquarters at Jefferson Barracks, Missouri. Redesignated 5 March 1843 as Regiment of Riflemen and concurrently dismounted. Remounted and redesignated 4 April 1844 as 2d Regiment of Dragoons. Redesignated 3 August 1861 as 2d Cavalry.

Assigned to 2d Cavalry Division 15 August 1927—15 July 1942. Inactivated 15 July 1942 at Fort Riley, Kansas; personnel and equipment transferred to 2d Armored Regiment (see ANNEX). Redesignated 15 January 1943 and activated as 2d Cavalry, Mechanized, at Fort Jackson, South Carolina.

Regiment broken up 22 December 1943 and its elements reorganized and redesignated as Headquarters and Headquarters Troop, 2d Cavalry Group, Mechanized, and 2d and 42d Cavalry Reconnaissnace Squadrons, Mechanized. These units converted and redesignated 1 May 1946 as Headquarters and Headquarters Troop, 2d Constabulary Regiment, and 2d and 42d Constabulary Squadrons, respectively. These units converted and redesignated by elements 16 November 1948 as elements of the 2d Armored Cavalry (Headquarters and Headquarters and Service Troop, 2d Constabulary Regiment redesignated as Headquarters and Headquarters Troop, 2d Armored Cavalry).

2d, 776th, and 19th Tank Battalions (see ANNEX) consolidated 8 January 1951 with 2d Armored Cavalry. (Battalions and companies redesignated 23 May 1960 as squadrons and troops.)

ANNEX

2d Armored Regiment constituted 11 July 1942 in the Army of the United States and assigned to 9th Armored Division. Activated 15 July 1942 at Fort Riley, Kansas, with personnel and equipment from 2d Cavalry.

Regiment broken up 9 October 1943 and its elements reorganized and redesignated as follows: 2d Armored Regiment (less 1st and 3d Battalions, Band, and Maintenance, Service, and Reconnaissance Companies) as 2d Tank Battalion; 1st Battalion as 776th Tank Battalion and relieved from assignment to 9th Armored Division; 3d Battalion as 19th Tank Battalion; Reconnaissance Company as Troop D, 89th Cavalry Reconnaissance Squadron, Mechanized (separate lineage); Band and Maintenance and Service Companies disbanded.

2d Tank Battalion inactivated 7 October 1945 at Camp Patrick Henry, Virginia. Relieved 9 January 1951 from assignment to 9th Armored Division.

776th Tank Battalion reorganized and redesignated 28 January 1944 as 776th Amphibian Tank Battalion. Inactivated 21 January 1946 at Camp Anza, California.

19th Tank Battalion inactivated 9 October 1945 at Camp Patrick Henry, Virginia. Relieved 8 January 1951 from assignment to 9th Armored Division.

2d, 776th and 19th Tank Battalions consolidated 8 January 1951 with 2d Armored Cavalry.

Campaign Participation Credit

Mexican War
- Palo Alto
- Resaca de la Palma
- Monterey
- Buena Vista
- Vera Cruz
- Cerro Gordo
- Contreras
- Churubusco
- Molino del Rey
- Chapultepec
- Nuevo Leon
- Tamaulipas 1846
- Texas 1846
- Vera Cruz 1847

Civil War
- Peninsula
- Manassas
- Antietam
- Fredericksburg
- Chancellorsville
- Gettysburg
- Wilderness
- Spotsylvania
- Cold Harbor
- Petersburg
- Shenandoah
- Virginia 1863
- Virginia 1864
- Maryland 1863

Indian Wars
- Seminoles
- Little Big Horn
- Nez Perces
- Bannocks
- Cheyennes
- New Mexico 1852
- New Mexico 1854
- Wyoming 1866
- Wyoming 1867
- Kansas 1869
- Montana 1870
- Montana 1872
- Montana 1879
- Montana 1880

War With Spain
- Santiago

World War I
- Aisne-Marne
- St. Mihiel
- Meuse-Argonne

World War II
- Normandy
- Northern France
- Rhineland
- Ardennes-Alsace
- Central Europe
- Leyte (with arrowhead)
- Ryukus

Troops additionally entitled to Campaign Participation Credit as follows;

Troop A:
Indian Wars
- Apaches

Troop B:
Indian Wars
- Oklahoma 1854
- Wyoming 1872
- Wyoming 1874

Troop C:
Civil War
- Henry and Donelson
- Shiloh
- Missouri 1861
- Tennessee 1862

Troop E:
Indian Wars
- Wyoming 1869
- Wyoming 1870

World War II—AP
- Western Pacific (with arrowhead)

Troop F:
Indian Wars
- Nebraska 1855
- Nebraska 1870

Troop K:
Indian Wars
- Montana 1881

Troop L:
Indian Wars
- New Mexico 1860

World I
- Oise-Aisne
- Champagne 1918

Decorations

Presidential Unit Citation (Army), Streamer embroidered BASTOGNE (2d Tank Battalion cited; WD GO 17, 1945)

Belgian Croix de Guerre 1940 with Palm, Streamer embroidered BASTOGNE; cited in the Order of the Day of the Belgian Army for action at BASTOGNE (2d Tank Battalion cited; DA GO 43, 1950 and DA GO 27, 1959)

Headquarters Troop, 1st Squadron, and Troops A, B, and C each additionally entitled to: Philippine Presidential Unit Citation, Streamer embroidered 17 OCTOBER 1944 TO 4 JULY 1945 (776th Amphibian Tank Battalion cited DA GO 47, 1950)